

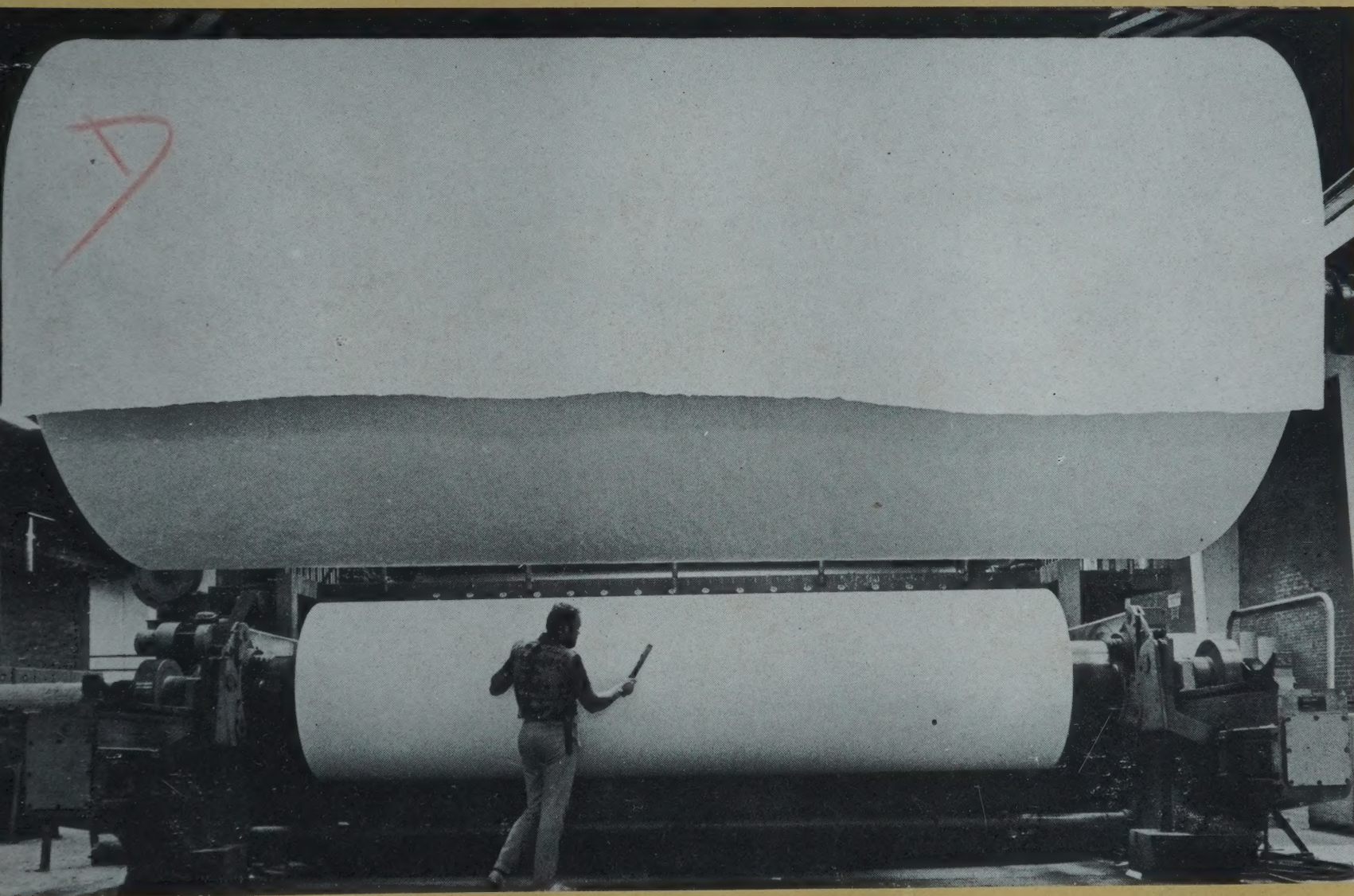
V. Wing

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an international journal of forestry and forest industries



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**It's time to make paper
in the tropics**

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It's time to make paper in the tropics

K.F.S. King

Of the world's stocked forests, 55% are in developing countries, but only 4% of the world's wood pulp originates from these. Up to now the absence of technology for utilizing mixed tropical hardwood for pulp and paper was a major factor in this imbalance. But this is no longer the case. The time is ripe, says the author, for the pulp and paper investors in industrial countries and the governments of developing countries to accommodate each other's interests and build more mills in the forest-rich nations of the tropics.

The most recent FAO analysis of trends in world consumption of pulp and paper indicates that in 1985 annual consumption will be almost double that of 1973. It is against this background that the availability of raw materials for pulp in the developing countries, and the potential of these countries for producing these raw materials, should be examined.

The growing stock of the world's forests comprises about 300 000 million cubic metres of wood. The annual increment of these forests is estimated to be 3 000 million cubic metres. The consumption of wood in 1985 for all industrial purposes is forecast to be 1 900 million cubic metres. For the pulp and paper industry in particular, the estimate is that 800 million cubic metres will be needed in 1985.

If the estimates of the annual increment of the world's forests are compared with the estimates of the requirements for 1985, it will be seen that increment is greater than requirements. However, if regional demands are compared with regional resources, it will be evident that in some regions, particularly in western Europe and in Japan, there will be (and already in some cases there are) serious local deficits.

Moreover, a not inconsiderable proportion of forests are located in areas from which it might be imprudent — for reasons of soil and water conservation, for example — to harvest as much as the growth rates of the forests might seem to warrant.

The developing countries possess 55% of the world's stocked forest land, but only 4% of the wood pulp which the world produces comes from these forests. What are the reasons for this apparent neglect of what seems to be a substantial and valuable reservoir of wood raw material?

One of the reasons is that many developing countries cannot themselves, from their own financial resources,

afford the capital which is required to establish viable pulp mills. Foreign exchange is often in short supply in the developing economies; the local markets are often too small to absorb the output of the large plant recommended to them by experts whose thought processes have been conditioned by the norms of the developed economies, and they would therefore have to export the excess. But the industry is notorious for its fluctuating fortunes, for its periods of excess capacity. The risk seems too great for them to operate in isolation. They therefore turn to the more industrialized countries for investment in this field.

And here we find a similar reluctance, a reluctance born not necessarily of a lack of capital and a shortage of foreign exchange but of an amalgam of factors — some political, some economic, some technical.

Many developing countries, in my opinion correctly, are adamant that they must control the exploitation and development of their natural resources. This does not preclude (and it is my information that they do not intend it

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to preclude) entering into partnerships with financiers from the developed countries, or the establishment of owner/management relationships with such financiers. Indeed, such relationships and partnerships exist, and there is evidence that they can work for the mutual benefit of the investor and the countries involved in these relationships. The essential factor seems to be political stability, but even this is debatable.

Be that as it may, it appears to me that these sociopolitical considerations have not been the main constraint to the establishment of pulp mills in the developing countries. It seems that the main obstacle has, in the past, been the state of technology of the industry.

Most of the developing countries lie in the tropics. Most of the natural forests of the tropics are found in the moist zones. These moist tropical forests are generally characterized by a multiplicity of species which grow together in an intimate mixture. In addition, the trees of the mixed tropical forests do not produce wood which has been traditionally used for the production of pulp, with the characteristics to which the technology, evolved in the developed temperate world, has been adapted.

However, over the last five years or so there have been remarkable advances in pulp and paper technology. It has been demonstrated that high-quality pulp, suitable for a range of end uses, can be produced from mixed tropical hardwoods, *on a practical and commercial basis*. Recent work in France, at the *Centre technique forestier tropical* in Paris, and in Sweden, at the *Stora Kopparberg* in Falun, supports these conclusions. Of course, the pulp produced from tropical hardwoods can also be utilized in a mixture with long-fibred pulp.

There are, at present, differences of opinion regarding the nature of the exploitation and harvesting systems which would be most suitable and economic to maintain the required degree of uniformity in the wood supply which would be obtained from the forest. One approach, which is currently being followed, is the separation at the post-chipping stage of the mixture of wood densities which has been harvested.

I believe that these remaining problems can be solved. The scientific basis now exists for the economic utilization of mixed tropical hardwoods. The commercial feasibility has been demonstrated. What remains is for arrangements to be worked out between potential investors and the owners of the forests in developing countries.

If what some may call my optimism is justified, much of the supply of the world's demand for pulp by 1985, *viewed in purely physical terms*, can be met from the mixed tropical forests

stocked by large, valuable, overmature trees which can be converted for the production of specialized end products which, *a priori*, would yield higher financial returns than if they were utilized for pulp.

Fifth, the very location of some of these forests probably militates against their commercial exploitation in the foreseeable future.

This list is not intended to frighten. It is presented merely to emphasize that not all the natural forests of the developing countries are available to the pulp and paper industry.

industrial countries face paper shortages by 1985 and forest-rich developing countries want their own pulp and paper mills; they ought to be able to accommodate each other's needs

of the developing countries. But this would be a simplistic view, for the following reasons.

First, there will have to be a considerable development of infrastructure in the developing countries to make many areas of tropical forests accessible to the producer.

Second, if scientific forestry is to be practised, if the known interrelationships of the forests, soil and water are to form the basis of land-use practices, if attempts are to be made to minimize the occurrence of floods and drought and the siltation of rivers and reservoirs, and if provision is to be made for the nonproductive uses of the forests, then the amount of wood available from the natural forests in the developing countries for pulp production cannot be assumed to be anywhere near the figure implied in the data presented earlier.

Third, increasing demands are being made in the developing countries for new lands to produce food. Some proportion of these lands will inevitably come from areas now under forests.

Fourth, much of the now unexploited virgin forest of the tropics is

Artificial forests, man-made forests and plantations must supplement supplies. Indeed, it may be argued that in some localities they should be the main source of supply.

The advantages of forest plantations are well known:

1. The species can be chosen for specific or various purposes and technologies; the forests can be tailor-made to the nation's requirements.
2. The locations of these forests can be chosen, not only to take advantage of the physical and climatic conditions most suitable for the growth of particular species, but also to take advantage of port facilities, other infrastructure, and the availability of labour, both skilled and unskilled.
3. The growth rates of plantations are generally much higher than those of the natural forests.
4. The cost of producing *a unit* of wood is often much lower in a plantation than in a natural forest.
5. It is more economic to engage in silvicultural practices such as fertilizing and tree breeding in plantations than it is in natural forests.

These *claims* are based on evidence,

on data which we have collected in FAO over the years.

Naturally, the rates of growth vary according to species, variety, site, rainfall, temperature, length of growing season and treatment. But there is little doubt that the mean annual increments for plantations in the tropics are considerably higher than those obtained in the temperate zones.

For example, in the north temperate zones and in the Mediterranean countries with a pronounced dry season, the mean annual increment for conifers is between 2 and 5 cubic metres per hectare per year; in the tropics and subtropics, the annual increment varies between 15 and 30 cubic metres per hectare per year.

More specifically, there are many areas from 30 degrees north of the equator to 30 degrees south of it in which *Pinus caribaea* gives an annual increment of from 17.5 to 21 cubic metres per hectare per year under bark, up to the age of 15 years at least. In the Kenya highlands *Pinus patula* and *Cupressus lusitanica* yield 18 cubic metres per hectare per year, and *Pinus radiata* gives 24 cubic metres. In Brazil, the average yield of 35-year *Pinus elliottii* is about 22 cubic metres per hectare per year, with minima of 16 cubic metres and maxima of 34 cubic metres.

The rates of growth are also remarkable for broadleaf species. Eucalypts, which are among the quickest growing hardwood species, give an annual increment of between 20 and 30 cubic metres per hectare per year. *Gmelina arborea* and *Maesopsis eminii* plots in Malawi and West African countries have a mean annual increment of 30 cubic metres per hectare per year.

These rates of growth permit, of course, very short rotations of plantation forests in the tropical and subtropical regions. Pulpwood rotations commonly take between 10 and 15 years; in the temperate zones they generally take between 20 and 30 years.

Although FAO data on the extent of man-made forests of species suitable for pulp do not cover all countries, it is known where trials on the establishment of plantations have been conducted and what results have been achieved. A bulk of information is



HIGH QUALITY PRINTING PAPER IN AN ITALIAN PAPER MILL
all the pulp was imported from Canada

therefore available, in FAO and in individual countries, which may be used for the immediate establishment of plantations.

rotations of 20 to 30 years in temperate zones are reduced to 10 to 15 years in the tropics

The rates of growth I have quoted were obtained without recourse to fertilization. There is evidence, however, that mean annual increments, especially in the early days of a plantation's life, may be increased by as much as four times through the application of fertilizers.

Recent work in central Java illustrates this point. The practice there is to seek the assistance of farmers in the establishment of teak plantations. The farmers plant the forest trees and between the rows of these trees various food crops are sown. In order, primarily, to increase the food crop yields, fertilizers are applied to the soil at the time of planting. The incidental result is that rates of growth of the tree crop have been increased by four times in the first year.

This is doubly significant. Apart from the physical increase in early yield, the forest canopy closes more quickly, weed growth is suppressed, and tending costs are reduced. From calculations I have made, based on the Javanese experience, it is evident that even if fertilizers were applied to the forest crop alone, the resultant increase in growth and reduction in tending costs would more than compensate for the cost of the fertilizer and its application.

I have tried to show that there is a growing demand for pulp and paper in the world, and this is more than likely to continue. In North America there might not be a negative balance in the supply/demand situation insofar as the raw material for pulp and paper is concerned, but there will definitely

be an increasing deficit in other parts of the world, particularly in western Europe and Japan. It is most unlikely that this deficit can be met from the traditional sources.

On the other hand, the natural forests of the developing world possess wood raw material which can be utilized for the production of pulp. In addition, the potential for the rapid expansion of fast-growing tree plantations in the developing countries exists. The assessment of this potential is based not on *a priori* assumptions of climatic and soil conditions but on trials conducted in many countries over a number of years and on a number of sites. Indeed, some industrial plantations have already been established in a few developing countries on a large scale.

The governments of developing nations are, of course, aware of the favourable raw material supply situation which exists in their countries. They are also conscious of the far-reaching effects which the establishment of pulp and paper mills can have on their economic development. Accordingly, they have had studies prepared on the feasibility of producing pulp and paper in their countries, sometimes with the object of utilizing mixed tropical hardwoods, sometimes utilizing plantation-grown hardwoods or softwoods.

Such studies have been prepared, for example, for Brazil, Chile, Guyana, Surinam and Venezuela, in South America; for Gabon, Ghana, Ivory Coast, Malawi, Nigeria, Tanzania and Zambia, in Africa; for Iran in the Near East; for Burma, India, Indonesia, Papua-New Guinea and Thailand, in Asia. It is evident that the governments of most of these countries would require financial and technical/managerial assistance if their plans are to be implemented. FAO is prepared to assist in the bringing together of governments and potential investors, in the hope that these plants would be established.

The strategy for the development of pulp production in the developing economies should be based on the two broad types of forest which are obtainable in these countries. The FAO forecasts indicate that if the present recession does not worsen, there will be an acute shortage of paper by as early

as 1978. If the present capacity to produce pulp and paper is not increased, the situation in the years following 1978 will deteriorate rapidly. The new capacity which should be established to alleviate shortages should preferably be located in the developing countries where the raw material exists, and should utilize, first, the mixed tropical hardwood species. At the same time, plantations for the production of wood for pulp should be established in these countries to meet the increasing demand for wood, to accommodate the shifts in land-use practice which are bound to occur as these countries develop, and to obviate the necessity of harvesting areas which are now inaccessible and which may be too costly to utilize for pulp.

plantations and mixed tropical hardwoods are the pulp sources of the future, and the future is at hand

The scientific knowledge for the growth of trees in the developing countries exists. The technology for the utilization of the mixed tropical hardwoods is known. The demand for pulp and paper is growing and will continue to grow. Most of the ingredients necessary for the successful establishment of pulp mills are therefore available. I believe that capital for investment in these projects may also be forthcoming. There remains, however, a prerequisite, which is dependent on the understanding by the investors of the desires and hopes and aspirations of the peoples of the developing countries, and on an appreciation by the leaders of the developing countries of the motivations which shape the policies and practices of the investors. It depends, in short, on an accommodation of interests for the mutual benefit of both parties. It has been my experience, during the last few years, that this accommodation can be achieved.

HOW TO MAKE PAPER IN THE TROPICS

The author explores some of the practical aspects and problems of establishing pulp and paper plants in developing countries of the tropics compared with developed countries of temperate zones. Plants in the tropics may be more costly and complex, he concludes, but they can be profitable for the investor.

Simeon de Jesus

Experience in the establishment of pulp and paper industries based on woods from the moist tropical forest regions is limited. Up to the early 1960s little use was found for these tropical woods in pulp and paper manufacture. Instead, the secondary vegetable or nonwoody fibres, such as bamboo, rice straw, bagasse and others, constituted the main raw materials. However, with the recent advances in pulp and paper technology and the stimulus of a worldwide shortage of paper, there now appears to be general interest in the development and utilization of the untapped wood resources of the moist forests in the tropical countries of Central and South America, Africa, and south and southeast Asia.

It will be noted that while the pulp and paper industry in the developed countries has flourished under traditionally accepted technologies, in the tropical moist forest regions this industry is just getting its bearings, often improvising techniques adapted to the raw materials. As more experience is gained, these tropical products are gradually gaining acceptance in world markets.

The tropical moist forests are located in the so-called underdeveloped or developing countries. Hence, in discuss-

ing the determinants associated with the setting up of a pulp and paper plant, the distinction between the factors attributable to the nature of the woods of the tropical forest and those due to regional underdevelopment is not made in this article. Five main considerations that could influence any plan for establishing a pulp and paper enterprise based on the utilization of woods from the tropical moist forests are discussed. These are: the wood raw material, the market situation, the infrastructural requirements, the role of the government, and the available labour pool.

The wood raw material

When one brings up the subject of tropical forests, the picture that immediately comes to mind is of a woodland area with a diversity of hardwood tree species, most of which are short-fibred. Homogeneity in species has never been a distinguishing feature of

these forests. It is not unusual to find more than 3 000 wood species in any one of them.

For those now actively operating in tropical forests, the profit emphasis is on log exports and on the manufacture of primary wood products such as lumber, veneer and plywood. The channelling of prime logs for pulp and paper would be most unsound because the acceptable price level of wood for the pulp and paper operation is very much lower than that obtainable from the exports of the logs or the manufactured primary wood products. What would be a more desirable arrangement is a programme of wood supply that would include the utilization of wood materials now hardly recovered from the normal logging operations. Many pulpwood materials can come from noncommercial tree species, damaged trees, defective residuals and logging waste such as bucking trims, tops and big branches. Ordinarily, all this would add about 30% more wood to the normal commercial logging production.

Unless the operation is structured for an integrated complex that brings together primary logging, secondary pulpwood logging, wood products manufacture, and pulp and paper manufacture, the economic feasibility

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of a less integrated set-up in the tropics would at best be very marginal. An operation involving only pulpwood logging and pulp and paper manufacturing would be burdened with the heavy costs of road construction and maintenance, without benefiting from the more attractive returns of primary log exports and the primary wood products. The integrated set-up, in effect, would be advantageous by maximizing the use of wood materials, reducing overall capital investments, lowering operating costs and inventories, minimizing equipment maintenance costs, and in general depressing fixed plant costs. In the natural forests of the tropics it would certainly be difficult to justify economically an operation involving only pulpwood logging.

Although there are areas in the tropics where indigenous long-fibred pines grow, these are not very extensive. The base raw material would therefore consist almost wholly of short-fibred woods, the limitations of which in pulp and paper manufacture are obvious. Where the strength characteristics of the paper end products are not critical, these hardwood species may be satisfactorily used. If, however, the requirement is for paper products for packaging and other heavy industrial uses these products, if made from hardwood species only, would find little acceptance in the market. Most enterprises in this situation would import long-fibred pulp for blending with the hardwood pulps. The cost of importing long-fibred pulp, however, can be prohibitive.

The heterogeneity of these forests is another characteristic that needs thorough evaluation. A large expenditure in pre-research studies, involving investigations into each of the principal wood species in these forest areas, would probably have to be made. There is still a dearth of information on the characteristics for pulp and paper making of most tropical woods.

Information needed

Another major handicap is the lack of information for proper management practices. This stems from the deficiencies in inventories and data on forest growth. However, this shortcoming is now being remedied in many countries in the tropics.

The costing of wood and wood



THE TUXTEPEC NEWSPRINT MILL IN MEXICO
government built and operated since the late 1950s

wastes in tropical forest regions is important in the establishment of a pulp and paper industry. The costs of hauling and delivering waste woods, for example, have to be carefully reviewed as they could turn out to be more expensive than even the primary logs of normal logging operations, particularly if the appropriate hauling system and equipment are not used. The question of costing waste woods also enters the picture. Should pulpwood and waste wood be costed separately to the pulp and paper operation? Also, should the primary logging operations function at arm's length from the pulp and paper operation and cost woods to the latter at a profit? To a large extent, management policies dictate the system of this costing, and the decision should be directed toward an optimized economic return for the overall complex.

Commercial plantations

Because of these problems of raw material costs, heterogeneity of wood supply and dearth of necessary forest management information, most tropical countries have national programmes for the planting of fast-growing — and sometimes long-fibred — wood species. Some hardwood species in certain areas are known to be harvestable for pulp and paper manufacture at 5 to 10 years of age, and long-fibred pines in 15 to 20 years. Commercial plantations have bright prospects. The obvious advantages of tree plantations are: (a) the development of a resource having a greater volume of fibre per unit area; (b) they provide homogeneous fibre raw material; (c) they make possible a concentrated wood supply close to the manufacturing operations, thus reducing delivering costs; and (d) they allow use of marginal lands not only for pulpwood production but, more important, for the prevention of soil erosion and for watershed management. Plans for the utilization of wood from the natural tropical forest for pulp and paper could be on a relatively short-term basis until (hopefully within 20 years) a sustained source of supply from tree plantations can take over.

The next important aspect to consider in any plan to establish a pulp

and paper manufacturing plant is the market. In most tropic regions, the manufacture of paper products is primarily aimed at import substitution. Production for export alone is seldom in the priority plan, although it usually happens that the combination of import substitution and export is eventually adopted, and proposed in the feasibility studies.

Import substitution is the preferred target for any pulp and paper manufacturing project. In this way, the products of the enterprise readily qualify for local government protection in the form of tariff duties against competitive foreign products, investment incentives such as tax suspensions, reductions or credits, financial support and guarantees, and many similar advantages. Normally, marketing policy is directed toward filling in as much as possible of the domestic demand first and then channelling any excess production to the export market.

Thus, while local or domestic sale is the preferred market outlet for most of these new projects, they also avail themselves of export sales, although these could be more difficult to maintain since production costs and shipping charges are in general very high. Where production is much in excess of domestic demand, however, export would be a natural outlet, but considering its disadvantages it would in all probability be motivated primarily by a desire to reduce fixed costs while ensuring the recovery of at least the variable costs of production.

At this point, it might be well to comment on the present state of the pulp and paper industry in a typical developing country. First, it will be noted that investment capital in most of these countries is short. Capital-intensive pulp and paper plants, therefore, are usually small. The economies of scale seldom benefit these projects. They could not possibly be competitive in the world market and as a business they would most probably fail in their own countries were it not for the protection provided by their governments. Furthermore, these small mills, because of the limitations of capital, are not growth-oriented. The need for improvements and expansions is usually hampered by the large capital requirements associated

with every plan for change. Thus, it can be seen that the insufficiency of capital, plus limited plant capacities and consequent high product costs, contribute to the depression of the domestic market. This is perhaps the biggest single factor that deters prospective investors from investing in pulp and paper in the tropical moist forest regions.

In studying the market potentials of these countries, the lack of an organized statistical record of activities in pulp and paper is a common and serious drawback. A reasonable estimate of consumption and demand for the end products is difficult to come by. Indirect surveys are most often resorted to, using other available market indicators from national sources if handy, or from international bodies such as the United Nations, FAO, the World Bank and others. Data on the gross national and domestic product, population growth rates, cost of living, per caput income, etc., could convey a good sense of the market, even though this might sometimes be arbitrary. Another possibility would be the direct approach, whereby individual interviews with established local importers and manufacturers could be used to obtain the information needed.

Newsprint first

The market for pulp and paper in the tropical developing countries is admittedly limited. The paper products that would find ready markets in these areas may be categorized as those that are essential for the growth of their economy. Much in demand, and in many of these countries politically preferred, is newsprint. Following this are the paper requirements of industry, which are mainly in the packaging classification. These may include wrapping grades, shipping bags and containerboards. Lastly, the most common grades that are usually popular with local producers are the writing and printing papers. It will be noted that the more sophisticated grades of fine papers are not normally found in these markets.

The general lack of infrastructure in the countries where the tropical moist forests are located is a feature much deplored by most investors, as this



SURVEYING A TROPICAL FOREST
the technology for using it already exists

usually results in a substantial additional nonproductive investment cost for them. In these countries, the contribution of the government to infrastructure development could be expected to be very minimal. Untapped forests are usually found far from urban areas and the national government's development of road networks in these distant places is hardly significant. For the government to build roads for one private enterprise could not be readily justified from the standpoint of national social gains.

With the absence of roads to the forest areas, the problems of transport of materials and supplies to the operating base arise. Where natural waterways are available these are utilized, provided they are adequate for barges

and other carriers of reasonable draft and tonnage capacities. Without access via water the building of permanent roadways for heavy transport vehicles would have to be undertaken by the private investors. In the tropics, where the rainy season can bog down operations, serious consideration must of necessity be given to the construction of the more expensive, although in the long run more economical, all-weather roads.

Community services

In many of the developed countries cheap power from hydroelectric facilities is available to industry. Rarely will this be found in the developing countries in the tropics. Thus, the

heavy burden of investing in a power station would be another key feature of any pulp and paper undertaking in the moist tropical countries. It should also be noted that the design of the power plant is not confined to manufacturing requirements alone. A significant allowance would have to be provided to cover the needs of the company town site, i.e., for housing and community services. The company town is a natural outgrowth of any undertaking located far from urban areas. The development and growth of this community become a moral responsibility of the company. If good personnel are to be kept, the community where most of these men will live has to be adequately provided with at least the basic modern facilities in order to keep them and their families contented. To accomplish this, the project's contribution to community development extends not only to housing but also to many other welfare activities such as schools, hospitals, recreational facilities and security. The initial costs may be high but the impact on the social development of a raw country is much more than can be measured. To the company, the benefits of a stable working man, happy with his family in a peaceful community, cannot be overestimated. This more than offsets the problems of the fast turnover of men usually expected in ventures distant from the conveniences of the modern urban communities.

The support of the government is a desirable requisite for any project of the magnitude of a pulp and paper manufacturing complex. In a developing country of the tropics in particular, the government can help create the favourable climate in which a pulp and paper mill can operate on a profitable basis. While the primary concern of the government would still be the enhancement of the social gains derived from the establishment of the new enterprise, i.e., the added employment opportunities, the development of a virgin natural resource, the opening of an underdeveloped area to other development opportunities, and so on, the corresponding returns to private enterprise can be even more remunerative.

The integration of national planning



WOOD FIBRE MICROSCOPICALLY ENLARGED
technology has enlarged the forest

with private project planning is perhaps the best way to ensure government support. In some countries, special government agencies have been formed to encourage the establishment of local industries. Incentives have been given when it has been shown that the benefits of more employment, increased consumption and savings, greater foreign exchange earnings and more income distribution are attainable. In other words, where the benefits of a private industry run in line with government goals, one can expect more government encouragement and support.

The influence of the government in any new project is tremendous. A good understanding of government policies and attitudes, and a fair amount of discretion and tact in dealing with the proper authorities would be very strong assets for the venture. It is, however, generally conceded that business conditions are strongly

swayed by the political stability of these countries. Understandably, new investment capital has always shied away from politically unstable areas.

The labour pool

The developing countries in the tropics have been known to have a high rate of unemployment. Whenever possible, therefore, labour-intensity is imposed even in capital-intensive projects such as pulp and paper manufacture. Preference for manual labour is made over automation. Although manual labour is usually associated with low productivity, the employment of more hands makes up for this, and the cost is balanced by the generally low labour costs in these countries. The social demands for more employment often dictate labour policies.

There is also the added disadvantage of the lack of workers skilled in industrial operations in these regions.

There will therefore be a need to import skilled labour and technicians to start and operate new plants until local men are trained to take over these various functions. This will add to the project costs.

We have attempted to point out some important features that are basic to the establishment of a pulp and paper plant based on the woods found in the moist tropical forests. Many of these problems would probably not be encountered in similar projects in the more developed countries. No mention has been made of other key factors involved in these evaluations, such as financing, production cost estimates, economic analysis, and others; normally these would not be any different from those used in preparing similar studies in the developed countries.

The apparent conclusion is that the determinants for the establishment of a pulp and paper plant in the tropical countries today are in many cases quite different from those encountered for similar projects in the developed countries. Although it appears that it would be more complex and more costly to set up a pulp and paper plant in the tropics, this does not preclude the possibility that the venture would still be a profitable one. ■

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A clean piece of paper

The author surveys the developments of the past decade in pollution control for pulp and paper mills, including legislation, and points out encouraging trends such as the development in the foreseeable future of closed water systems which will result in virtually no effluent discharge.

John E.G. Sikes

The pulp and paper industry probably felt relatively little compulsion in the past to cope with, or even acknowledge, the environmental ramifications of its manufacturing process. Profitability was paramount. Recently, the industry has been making rapid progress toward combating pollution, instigated by legislative pressure, social compulsion, or the basic need to become more efficient.

In undertaking pollution control programmes the logical area of initial endeavour is within the production process. It has been estimated, for example, that in the average mill one third of losses to the sewer occur as a result of leaks and spills. In many mills this proportion is certainly greater. As water, fibre, energy and chemicals become increasingly valuable, special attention is being given to the efficiency of the production pro-

cess, and the recovery rate of materials and chemicals.

Many of the steps being undertaken by existing mills relate to modifying the process. Some examples are: conversion from wet to dry debarking; better washing of pulp and recovery of cooking chemicals; more complete utilization of rejected fibre; modification of bleaching sequences and more countercurrent washing in bleach plants; improved evaporator and recovery operations; stripping of condensates for re-use; closing up paper machine white-water systems; upgrading precipitators and scrubbers; installing spill control facilities; improving monitoring and instrumentation. Perhaps the most important innovation is the introduction of educational programmes to improve operator motivation.

The list is lengthy. During the past ten years the water use of new pulp and paper mills has been reduced by a factor of two or more. Similar reductions are possible for total losses of chemicals and fibre. Atmospheric emissions of mills constructed today are a fraction of those of a decade ago.

For existing mills it is frequently difficult to undertake extensive process modifications in one step, due to the

interdependence of the many production components. A gradual programme is normally implemented.

It is probable that in industrialized countries no pulp and paper mill is being constructed today, or even considered, without environmental factors being taken into account. Again, a decade ago, such factors would have been considered only superficially.

Treatment

The methods used for external treatment of effluents from the industry are generally derived from municipal techniques: sedimentation, sometimes with chemical addition to improve performance, various biological treatments and efficient dilution in the receiving waters. Where irrigation is practised, increasing consideration is being given to the acceptability of effluents for use as irrigants. Some countries pay particular attention to the eutrophication issue, and also to the colour of effluents, especially from bleached sulfate mills. To date, methods for removal of colour and nutrients generally involve chemical coagulation and precipitation.

The equipment being used to con-

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trol air pollution includes high efficiency precipitators, scrubbers, fabric filters, inertial separators and incinerators.

The pulp and paper industry is currently undergoing a stage of rapid change in its implementation of pollution control measures.

New mills, certainly those in industrialized nations, are required to achieve rigorous effluent and emission criteria, usually through the use of proven modern technology. The regulatory criteria are such that not only appropriate treatment systems must be installed, but the basic process must maximize water re-use and recovery of chemicals and fibre. Enormous strides have been taken in the last few years to achieve the ultimate goal of a pulp and paper mill having no effluent discharge.

New mills in developing countries are usually subject to some form of environmental assessment, with process, treatment and disposal schemes specific to their own needs. While perhaps not as advanced as in industrialized nations, the approach is nevertheless similar. Developing nations may decide that it is better to forego technical innovations which entail some risk, in favour of reliability.

For existing mills in all countries, but more especially in industrialized nations where legislative machinery reacts more quickly to the public's demands, and where the major technical expertise exists, the situation is changing rapidly.

Saving water

With few exceptions, all mills have in recent years undertaken programmes to economize on water use and to control obvious sources of loss of fibre and chemicals. These are normally evaluated and undertaken by mill personnel, and usually represent an economic benefit.

A further step which is under way in many mills is one which involves the use of advanced proven technology, such as improving washing efficiency, closing up screening systems, reducing bleach plant water use, stripping condensates, and installing equipment to reduce atmospheric emissions and external treatment plants.

The most advanced companies are now entering a third stage: the use of technology not yet commercially proven. Examples include new pulping and bleaching processes, totally new equipment and radically different treatment technology. Some of these schemes are entering the pilot or demonstration plant phase. They are motivated by government or industry grants, concern for the environment, improvement of product quality, economic advantage or sheer inventive drive.

REDUCTION OF POLLUTANTS AS PROJECTED FOR 1970-75

(Table 1)

Country	Suspended solids	BOD ₅
	Percent	
Canada	55	24
Finland	57	16
France	47	16
Germany, Fed. Rep.	13	17
Japan	47	37
Norway	18	10
Sweden	51	50
Switzerland	55	77
United Kingdom	33	17
United States	47	66

SOURCE: *Pollution by the pulp and paper industry — present situation and trends*, Organisation for Economic Co-operation and Development, Paris, 1973.

Other broad environmental factors associated with the industry must not be ignored. Much is being done to improve forestry management; increasing attention is being given to the health and well-being of personnel; there is greater cooperation with the public sector.

A major difficulty in the analysis of quantitative trends in the discharge of pollutants by the industry is the dearth of statistical data from many countries and the lack of a mechanism for national or even international comparison. This problem is compounded by the assorted monitoring and analytical techniques used.

There is no question that the quan-

tity of pollutants discharged by the industry, per unit of production, has been progressively reduced over the years. It is possible to construct a modern pulp and paper mill with a water use of one fifth to one tenth of that of an older mill, with a concurrent reduction of pollutants.

In terms of total quantity of pollutants discharged, it is probable that there was a progressive increase up until about 1970 due to increased production. All major pulp and paper producing countries have projected a systematic reduction from 1970 onward, despite augmented productive capacity. Table 1 summarizes projections of a study by the Organisation for Economic Co-operation and Development (OECD) of the estimated reduction of Biochemical Oxygen Demand (BOD) and suspended solids between 1970 and 1975 for selected major producing countries, notwithstanding increased production.

National variations

These projections were made in 1971, when the data base was limited and, more important, at a time of rapid evolution in the formulation of national environment policies. The data are not strictly comparable, as during the reference year, 1970, the programmes in some countries were significantly more advanced than in others. Also, the definition of the parameters BOD and suspended solids varies from country to country.

Little information is available regarding the achievement of these objectives. Factors which affect the actual timing of individual programmes include market conditions, profit, regulatory agency attitudes, money supply and technological developments. Without firm statistical data, it would seem that the OECD projections remain generally valid, although in some countries the 1975 target may have been postponed.

Not enough basic data were available to the OECD group to make predictions on pollutant emissions to the atmosphere, but the same declining trend is apparent.

For the developing countries, the situation is even less clear. It might be hypothesized that in view of the



AERATION PONDS FOR EFFLUENT TREATMENT AT A SWEDISH PULP MILL
not a luxury, a necessity

ever-increasing need for improved efficiency, discharges and emissions are being reduced accordingly.

Measures so far taken by the industry to combat pollution have generally involved the application of proven technology. These methods have evolved gradually and, once proven, have been increasingly accepted. Even so, some techniques commonly practised today would have been deemed unfeasible a decade ago. There are several mills, most of them

manufacturing board products, that operate on almost totally closed water systems. One can foresee, in the not too distant future, paper mills making low-grade products having an essentially zero effluent discharge.

In the chemical pulp industry the same goals, considered futile only a few years ago, are thought by some to be now on the horizon. Several sulfate pulp mills operate with almost totally closed water systems in the washing and screening areas, and

bleaching technology is approaching the stage where water can be reduced to levels whereby the bleach plant effluent may be returned to the recovery cycle. At the same time new problems arise, such as a build-up of impurities in the various liquor systems. Methods are being developed to overcome these.

Increasing attention is being given to the development of less polluting pulping and bleaching techniques: some new pulping methods eliminate

AVERAGE WATER POLLUTION CONTROL COSTS AS PROJECTED FOR OECD COUNTRIES¹

(Table 2)

Industry sector	Estimated costs	
	1970	1975
	... U.S. dollars/ton ...	
Semichemical	2.34	8.89
Sulfite pulp and paper	2.48	11.70
Nonintegrated sulfate pulp	0.86	3.16
Integrated sulfate pulp and paper	1.31	5.52
Newsprint	0.64	2.63
Paper and board	1.08	3.04
Fibre building board	0.64	2.12

¹ OECD data were projected for mills in operation in 1970. Air pollution control costs were also displayed for some countries and, although obviously varying by production category, were significant. Estimated costs are based on 1970 level.

the use of sulfur; for groundwood, generally used in the manufacture of newsprint, new systems are being tried to improve pulp strength characteristics, and thus reduce and possibly eliminate the chemical pulp addition now required for quality considerations.

In bleaching technology, sequences are being researched to reduce or eliminate the traditional bleaching chemical used, and at the same time improve the quality of the bleachery effluent. Gas-phase bleaching and various forms of dynamic bleaching are also receiving consideration.

Air pollution control techniques under study include various process changes, and improved scrubbers and precipitators.

In the waste-water treatment field, methods being developed include chemical treatment of effluents, alternative means of dewatering sludges, biological treatment variations, absorption, reverse osmosis, and ion exchange.

While these efforts in pollution control research and development are being made, it is regrettable indeed that no mechanism for the exchange of information among countries should

have been established. This situation will almost certainly result in duplication of effort and some inefficiency in application.

It must be admitted that it is becoming increasingly difficult to estimate the cost of pollution control systems. Traditionally, control costs were those "over and above" those required for the normal operation of a mill. Today, when control measures are becoming increasingly integrated with the production process, cost distinctions are becoming vague.

Despite this, environmental costs are a growing economic burden on the industry. In addition to water and air pollution control expenses, others, involving modifications to forest management practices, improved working conditions, and so on, must also be recognized. The OECD report gave cost estimates for 1970 and 1975, expressed as 1970 costs, for water pollution control. These estimates were averaged over those countries where reasonable projections were available for various sectors of the industry.

The cost

The capital investment required by industry to install protection facilities is substantial. The OECD report estimated that during the period 1971-75 approximately US\$3 000 million, at the 1970 cost level, would be required by the pulp and paper industry in OECD member countries to finance pollution control facilities for those mills that were operating in 1970. The information, where available, indicated that approximately the same funds would be required for the second half of the decade.

When allowance is made for cost escalation, and for non-OECD countries, it may be calculated that the capital requirement for the worldwide pulp and paper industry to finance pollution control installations in this decade is about \$10 000 million.

A pertinent estimate made by OECD for its member countries was that the pulp industry would need some 40% more capital to finance pollution control, in addition to that needed for increased production capacity, between 1970 and 1980. The corresponding

TYPICAL COSTS OF WATER POLLUTION CONTROL¹

(Table 3)

	BOD ₅ removal			
	60%	85%	90%	98%
	... U.S. dollars/ton ...			
300 TPD bleached sulfate	3.6	5.0	9.2	14.6
750 TPD bleached sulfate	3.1	3.6	7.4	12.0
750 TPD unbleached sulfate and sack paper	2.5	3.4	5.8	8.4
300 TPD coated fine paper	1.5	2.6	7.3	6.5
300 TPD bleached sulfate and coated fine paper	4.2	5.2	10.0	16.2
350 TPD groundwood-newsprint	1.9	3.6	5.6	7.7

SOURCE: A study of pulp and paper industry's effluent treatment, prepared by EKONO Consulting Engineers for the Advisory Committee on Pulp and Paper, 13th Session, Rome, 15-16 May 1972. (Available from EKONO.)

¹ Costs are based on 1971 level. The EKONO report stressed that the cost estimates were for typical new mills only. It is probable that to achieve the same level of treatment in different countries, somewhat different costs would be involved. In individual instances, the difference would be substantial.

figure for newsprint was 20%, and for paper and board, 10%.

Many governments have adopted measures to help industry meet the cost of environmental control programmes, at least in the transition phase. Such measures include:

- Direct subsidies or grants.
- Tax reliefs, mainly in the form of accelerated write-offs.
- Loans from public funds, usually with a preferential rate of interest.

The OECD report emphasized that benefits from subsidies vary widely among countries. The effect of these benefits may be increased by freeing additional funds for productive investment purposes.

The structure of the pulp and paper industry is such that normal market forces generate considerable effect on the short-term outlook. The industry is capital intensive, and thus cannot easily trim production during times of low demand. When demand exceeds capacity it is possible to raise prices considerably, due to the low price elasticity of demand of paper products. Thus, unless demand and capacity are balanced, swings in product price can be anticipated.

Certain sectors of the industry are more vulnerable than others to adverse market conditions. When the market is slack, older, less efficient mills have disproportionate difficulty in competing economically. This applies especially to the sulfite pulp industry, which may largely be substituted by sulfate pulp. Environmental control requirements merely add to this burden, and may be accelerating the closure of inefficient mills. In areas where the mill is the sole employer, local social disruptions are great.

Differing views

Since environmental costs vary from country to country, and even from mill to mill, it is difficult to define the point at which cost and ultimately price disparities become relevant in broad economic or social terms.

There seems to be wide disagreement as to whether these costs are significant to industry, as evidenced by the following arguments:

— Since the pulp and paper industry

is so vulnerable to market forces, and some sectors of the industry are less stable than others, added environmental costs can only compound already difficult situations, particularly in the short term.

— It is becoming increasingly difficult for the industry to attract outside capital for productive investment, let alone environmental expenditure. Pollution control requirements have thus taken internal capital for non-productive investments, resulting in decreased new production and hence better market conditions and greater profitability.

— The cost increases are relatively

small, and spread over a long period, and in any event environmental costs should not be viewed in isolation: there are many other factors, some of them flexible, which determine the selling cost — raw materials and chemicals, transportation, energy, labour, capital charges, taxes, duties, etc., several of which are widely different between and within countries. Pollution control costs are merely additional manufacturing costs, and their impact is indefinable.

There seems to be some validity in each of these arguments, the first saying that environmental expenditures



PULP SLOSHING, FIRST STAGE IN A PAPER MILL

don't split it!

THE DIRECTION OF LEGISLATION

The philosophical approaches used by various countries in developing environmental legislation for the pulp and paper industry vary widely. They range from the use of the assimilative capacity of the environment to the application of practical control technology. These approaches are translated into legislation through the following systems:

- Discharge fee: this is a tax, based on the quantity of specific pollutants in the effluents, sometimes on an increasing scale with respect to time. The revenue collected is usually used for the construction of treatment plants. This system is used in several European countries.
- Case-by-case analysis: the discharge of effluent is assessed individually, based on the assimilative capacity of the receiving waters. In some countries, this system is simplified by classifying waters into various categories, and relating allowable discharges to these categories.
- Uniform standards: all discharges must comply with uniform minimum standards, applied nationally or re-

gionally. In some instances local environmental circumstances may override these standards and require more stringent effluent criteria.

In most countries the trend is for new mills to be required to conform to the regulations from the start of operations, and for existing mills to conform either by a specified date or by a phased programme of improvements on a schedule negotiated with the regulatory agency.

In developing countries

In the developing countries, as well as in those countries without legislation specific to the pulp and paper industry, the environmental issue is generally recognized. When new production is being planned, and particularly when international agencies are involved in the planning process, some form of environmental impact assessment is usually required. This forms the basis for determining not only acceptable process and treatment criteria, but also the overall environmental implications of the project.

have hurt the industry; the second, that they have helped it; the third, that there is no noticeable change.

It may be suggested that those countries or mills which have less stringent pollution programmes, or, alternatively, receive greater subsidies, enjoy a relative economic advantage, either through increased profitability or through the release of more funds for productive expenditure.

On the other hand, it can be argued that these countries will be placed in a less advantageous position if they have to increase the impetus of their programmes. Conversely, the countries which have the most stringent requirements may be undertaking more than is strictly necessary to create a harmonious environment.

In developing countries with pulp and paper mills, where production is generally for the domestic market, the problem of environmental protection is mainly an internal question, with curtailment of gross pollution the prime objective. However, these countries tend to be net importers of chemical pulp, and have to absorb any additional pollution control costs which

have been included in the product price.

In the future, the pulp and paper industry in developing countries is likely to reach a point where its products are marketed internationally. In the absence of specific legislation, an environmental impact assessment may be undertaken for each industrial complex, and the most suitable control measures developed. Pollution control costs are therefore likely to be lower than those of most developed countries, where blanket control legislation exists for the industry.

The consumer

The costs of pollution control are becoming increasingly significant, to the consumer as well as the industry, as they are eventually reflected in the product price. The resulting higher product prices give the consumer the choice of accepting them and suffering some financial hardship or of reducing his consumption of the product. In either case it is necessary that the consumer make some sacrifice. The benefits, both direct and indirect,

of application of environmental control measures are still poorly understood.

It is apparent that the approaches to environmental problems in the pulp and paper industry vary widely from country to country. As many countries are still evolving legislative methodology and control techniques, while others are only considering them, the issue of closer international participation should be explored. As a basis for consideration, the following points may be useful.

- Monitoring techniques and analytical procedures vary widely among nations. Since many countries have yet to establish uniform procedures, it would be desirable to develop standardized testing methods.

- There is at present no formal mechanism for the international exchange of environmental statistical data for the industry. In most countries data collection methodology is only just being developed. If more exchange of statistical data is desirable, it may be useful to develop consistent procedures.

- Pollution control techniques vary, and there seems to be some duplication of research and development effort. A formal means of sharing technological information would be practical.

- It would be helpful for those nations which have yet to develop specific environmental legislation to have better knowledge of the rationale behind the various enactments in other countries.

- The impact on society of increased costs for pollution control is still poorly understood, and it may be questioned whether society is aware of the implications of certain environmental programmes. Informing the public of these could thus be advantageous.

There is an aspect of the pulp and paper industry that has received little attention: from the environmental standpoint its technology is highly advanced. Usually when countries draft specific environmental legislation, this industry is among the first to receive attention. Credit should be given to the industry for developing antipollution technology. It is important that the dialogue with it be encouraged. ■

Designing forest services to suit the country

It is time for those developing countries which built their forest services on European models to reassess what they have and what their real forestry and development needs are. The author analyses the problem and various structural solutions.

Louis Henri Velay

PART I: EXAMINING THE STRUCTURE

For many of the developing countries the task of building a modern administrative structure for forestry is a difficult and challenging one. Forest services in most of these lands were originally organized along the lines of European models, but many of them now feel they must develop according to their own particular needs.

Governments and public opinion have not always realized soon enough that the forest represents a major asset which should be exploited for the greatest good of the nation as a whole and the state has often not made its authority felt in defending its woodland areas against all sorts of pressures. Unaware of the many benefits that a long-term forestry policy can provide, the authorities often fail to take steps to provide the investments or the planning necessary for more extensive utilization of the for-

est's wealth of resources, for the transformation of these resources into wood products and for the opening of new markets. A skeleton forestry administration, insufficiently diversified and too centralized in the national capital, cannot control the exploitation of forests at close enough range. As a result, the resources of the forest service are wasted.

Today, forestry officials in many developing countries have a good opportunity for re-examining and re-evaluating these structures, to see whether and how they can meet the needs and the potential for growth of these nations.

Certainly, developing countries are becoming more and more aware of the value which their natural resources represent for the whole world, and particularly for their trading partners in industrialized countries. Widespread changes affecting petroleum, minerals and other raw materials apply as well to wood, a building material which is in growing demand and a raw material needed by a heavy industry which is increasingly concerned about its sources of supplies.

This awakening of concern over raw materials in the developing countries, together with the industrialized countries' rising interest in tropical forest resources, should induce both sides to improve the basis for cooperation in forestry development. Nations in a position to help should offer more assistance in securing capital, equipment and training, and in this way favour the renewal of the forest services of the developing countries.

Two factors justify a new departure for foresters in the developing countries: the rise in the market value of forest products in recent years, and the potential of forestry and its related "downstream" industries to provide stable employment in rural areas.

Foresters would do well to broaden their horizons beyond forest protection and valorization. A global development responsibility should be extended to include the forests in those areas where they furnish the framework for life, where they are the focus of activity for a local population, or where pastoral economies and farming depend directly on the condition of the forest.

The direction of the current economic situation — including the growing importance of the forest for recreation and tourism and the impact of forestry development on the nation's

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socioeconomic advancement in general — should serve to persuade governments to strengthen and improve their forestry administrative structures. Moreover, although the situation is still not ideal, there have been improvements in the conditions under which many countries can now recruit, train and employ the kind of personnel they need — forest rangers, administrators, engineers, technicians, etc. The moment has come, therefore, for governments to ask: how can we remodel, develop and expand our forest services?

There is, of course, no ideal structural model that will work equally well everywhere. The authorities should therefore be guided by various considerations. For instance:

- The degree of population pressure on the forest. The same kind of organization will not suit a country with a small population and abundant forest resources and another with a dense population living in and around forests which may also be limited in area.

- The forest's relative importance to the territorial balance, the national output and foreign trade; the priorities allotted respectively to production, employment and environment.

- The availability of short-term means that can be mobilized to put forestry policy into effect, and especially the availability of qualified personnel.

Determining factors

In all instances, realism and respect for efficiency, rather than doctrinaire preferences or prestige considerations, should be the determining factors in making decisions and creating structures. Administrative organization is the tool of national forestry policy; it should evolve according to a set of priorities and the means should be found to enable it to function effectively. Let us examine some of the general aspects of the problem.

Fitting the forest service into the government structure should not simply conform to tradition or a wish to balance out responsibilities between different department heads. Like the relative weight given to the various components within the forest service,

the placement of the service should be decided according to how it can best fulfil priorities both in production and the protection of the environment.

Like the choice of personnel to be recruited, investment decisions will not be made in the same way by a ministry of economics and a ministry for the

and financial authorities to lean toward an "economic" approach or an "environmental" one as regards the administrative location of the forest service.

It is obvious that a forest service which is part of a ministry of natural resources will not have its performance



HONDURANS CALCULATE STAND VOLUME
forest services were created for work like this

environment or natural resources. The way in which the forest service's actions will be judged, by public opinion in general, and by farmers, hunters, wood industry workers, tourists and naturalists, will depend to a large extent upon how the forest service itself is situated within the overall structure of the state. Current trends — and present economic circumstances — can, to some degree, cause political

measured so much by economic standards and that its nonproduction forestry benefits will be taken into greater consideration. Furthermore, as part of a ministry of natural resources, foresters will be in a better position to catch the minister's ear than if they are merged into a big economic ministry, or into a ministry of agriculture which is bound to be preoccupied with short-term crop problems.

In many developing countries, the overlapping of forestry problems with those of agriculture and stock breeding, the need to arbitrate decisions over the utilization of land and water, and the need to find a judicious agrosylvan-pastoral equilibrium, make it preferable to attach the service to a ministry — and sometimes even to regional and local structures — in charge of rural development. Locating the forest service in a ministry of industrial development, which also sometimes happens, will result in priority being given within the service to the production and marketing of finished wood products.

There is another possibility. In countries where the forest constitutes a major economic resource, there may be justification for the creation of a separate ministry dedicated entirely to forestry and forest industries development.

Whatever solution is chosen, consideration should be given to how that particular structure will condition relations between foresters (and forestry) and the government, the other administrative bodies, the professional groups and the public as a whole.

Centralization vs. decentralization is another important question. For certain state services, such as public health, education, social services, distribution of water, there are distinct advantages in their being located at the regional or local level. Such decentralization, however, is not necessarily favourable to the exercise of good forestry policy. In some countries lacking a strong forestry tradition, the full authority of the national government — in terms of federal law, for example — is necessary to impose the sort of restrictions which are required to protect resources. Planning on the national scale means getting better forest management, because of the forest's role in the general national balance and economy. For instance, the cost of setting up wood-processing plants in a developing country usually exceeds the possibilities of a state or regional authority of that country. Wherever they may be located, the forests constitute a common asset for the entire nation.

Moreover, leaving the legislation and regulation of forestry affairs to a de-

centralized authority — for example, in separate states — can result in notable and damaging differences within a nation. It can give rise to the kind of contradictions which make it difficult for those in charge of forestry operations to respect forest service regulations. The harmonious coordination of forestry policies and legislation by the central power is, in any event, a minimum requirement.

“Their” forests

In forestry the support of the local people is indispensable. Sound management practices will be all the more welcomed by them because of their concern for safeguarding and getting the most value from “their” forests. This means that it is a good thing to leave the ownership or the revenues of a part, at least, of the forests to local collectives and rural owners of small holdings. Such a formula is not incompatible with a forest service recruited, trained and structured on the national level, providing that the population derives direct advantages in terms of jobs and management benefits.

Forest services may be assigned two groups of activities which are essentially different yet to a certain extent compatible.

The first involves the exercise of authority as an instrument of public power in the service and general interest of the population. In terms of

administrative authority, it is the duty of the forest service to define policy and ensure its application to all forests, to terrain reserved for the purpose of forestry, and eventually to other natural or wild areas. As an authority, the role of the forest service is to define, animate and inspect. It can also promote various forms of incentives and impose penalties.

Under the second group of activities comes the management of enterprises. One or more enterprises may have a number of technical, industrial and trade activities, particularly in state forests, but also, at times, in other forests, as well as in those sectors of the national economy having to do with forest products. The activities of these enterprises may include:

— Forest management, from the nursery to supervision of logging and transport.

— Economic management, including silviculture, wood processing, promotional marketing of forest products.

— Tourism and hunting, including the supervision and management of the forests and other natural areas for purposes of recreation and tourism, and wildlife management.

From all the foregoing it can be seen that a forest service's organization is *a priori* complex because of its twofold mission. In the second part of this article we shall examine various organizational models for the creation of the kind of forest service most suitable to a nation's needs.

PART II: IN RESTRUCTURING FOREST SERVICES THERE ARE VARIOUS MODELS FROM WHICH TO CHOOSE

For a long time in developing countries, no less than in those developed countries which were regarded as blueprints for forestry development, the role of foresters has been essentially that of exercising administrative authority.

Aside from management, forest ad-

ministrators paid little attention to “enterprise” activities. Apparently foresters believed that their duties ended with assuring the “preservation” of the forest domain and, in more advanced countries, maintaining “sustained yield.” Follow-up activities i.e., felling and transportation of tim-

ber, wood processing and marketing — did not concern them. Today, however, a new approach is increasingly desirable. Foresters and forest services should devote their attention to the products of their management and actively supervise and promote the ensuing operations. This does not imply, however, that the two functions, the exercise of administrative authority and the handling of commercial operations, should of necessity be entrusted to the same administrative structure.

The duties of the forestry administrative authority can be grouped under the following main headings:

- Forestry policy and forestry development planning.
- Preservation of the forest and of other natural resources.
- Supervision of logging and other forms of forest exploitation.
- Encouragement of forestry development.
- Information and public relations work.
- Education and training.
- Research.

Whether actual forest domain management should be the responsibility of the forestry administrative authority is optional, as we shall see.

Evolution

Throughout the development period, forestry administrative structures must conform to the general pattern of forestry policy as far as is consistent with the country's resources in terms of trained manpower, infrastructure and available funds. As development proceeds, tasks will have to be adjusted to changing economic and social conditions and to the emergence of more clearly defined policy objectives.

A nation's forestry can evolve in three successive stages:

- Gradual consolidation of forestry objectives.
- Implementation of those objectives.
- Advanced forestry.

The first stage involves a conscientious appraisal of "forestry values" at the political level. There will probably be a sizable difference between the magnitude of the work to be undertaken and the means available, in particular the qualified personnel available. The criterion of feasibility will

therefore have to be strictly applied, and the administrative structure will have to be as efficient as possible while not overly ambitious.

The second stage will be attained when pertinent legislation and regulations are defined and completed and the forest service personnel are sufficient to man the central services and staff the forestry territory with foresters or other qualified persons.

The third stage, advanced forestry, should permit full, balanced development of forestry structures throughout the responsible offices, at central and regional levels as well as in the field, within the context of the policy objectives finally established.

In the subsequent stages of development, economic and social priorities will lead to adjustments in the form and size of the specialized teams responsible for the various sectors.

Here are two examples of this gradual adaptation. The first concerns forest utilization control. At the outset, particularly when personnel is in short supply, harvesting permits, or the granting of concessions, would seem to be the only method affording speedy and extensive action. However, the state is thereby deprived of considerable revenue and must confine itself to collecting taxes assessed on the various phases of timber utilization and sales. The concessions system is a haphazard and sometimes unsuitable instrument of forestry policy, and its protracted use may be detrimental to the forest. Giving concessionaires freedom to make their own choice of site, time, programme and extent of felling is obviously incompatible with the gradual application of advanced silviculture. Some regions will be overexploited, others neglected; utilization will be inadequately supervised by insufficient personnel.

It is therefore advisable, as the administration develops and access routes penetrate deeper into the forest, to:

1. Rationalize the system through prior demarcation of stands by the forest service. In so doing extreme caution should be exercised in defining the crop to be removed. There should be close supervision and checks on utilization status, and long-term agreements should be reserved for companies processing the bulk of produc-

tion inside the country, and providing permanent employment for the population.

2. Set up a system linking sales with cuttings as soon as possible.

Once qualified personnel are available, utilization could profitably be farmed out or contracted under the responsibility of the forest service or of autonomous agencies under state control.

Research

The second example of adaptation concerns research. Developing countries should exercise caution so long as their overall development (in the areas of economics, industry, universities, research in other fields) does not allow them to set up a sufficiently well-equipped and diversified forestry research unit.

Meanwhile, progress in forestry techniques can be fostered by taking advantage of successful research elsewhere. Some of the benefits achieved in the developed countries could be transferred, providing that they are scrupulously adapted to local ecological, social and economic conditions. Such transfers are particularly advantageous where research is highly technical and costly.

To adapt the results of research from other countries (or from regional institutes, which may be working closer to local conditions), the establishment of new and costly units would be both premature and unnecessary. Better to set up a forestry technical centre, which would mainly be designed to:

- Identify and select the scientific and technical information required.
- Keep abreast of research advances achieved internationally, by neighbouring countries, by developed countries and by related disciplines (ecology, soil, agronomy, etc.).
- Derive practical models for action from these research findings for use by the national forest service and particularly by its field teams.

Eventually the country will have its own forestry research programme, which should concentrate its efforts on exploring specific national problems — the technology of indigenous tree species, genetic improvement of forest trees, the techniques of regeneration,



BUILDING A SAWMILL IN MALAYSIA
creating industries is another job of forest services

ways of dealing with insects and diseases, to name a few. Even then, the technical centre will be an efficient instrument for progress, digesting and passing on research findings to the operational echelons.

When we consider the problem of managing forest stands and, even more pertinently, the utilization, processing and marketing of forest products, the question arises: is a civil service type of administration well enough equip-

ped to carry out these operations successfully?

It has been observed that assigning tasks of this sort to officials conditioned by the standard routine of administration could lead to disappointing results, because of the qualities and shortcomings usually attributed to the civil service. These qualities and shortcomings include impartiality and objectivity, a deep respect for the law and for rules and regulations — but

also a disinclination to take the initiative, to discard traditional practices and explore new horizons, to run risks. On the other hand, it could be expected that men coming from public or private enterprises, recruited on the basis of their specialized professional training, would feel more directly involved (for personal reasons also, including promotion) in the technical and financial success of their work, and be more enterprising and dynamic than officials who are sure of their careers.

These arguments are certainly debatable: there is no dearth of administrations that have performed their tasks with good results over a long period of time — in management, for example. But, because of the stiff recruitment qualifications an administration may well encounter difficulties in procuring specialists already much sought after in other sectors: mechanics, engineering, information, management and marketing, etc.

Financing

Financing forestry activities can be a serious problem for forest management. Financing forestry work undertaken by the state or by authorized enterprises calls for original solutions. The budgetary and accounting practices usually applied to administrative procedures are unsuited to forestry. To begin with, as we have already pointed out, it cannot be run on the same lines as an agency which is solely intended to provide a public service. Moreover, forestry plans and programmes must be organized on a long-term basis, with the full financial benefits forthcoming only after a considerable time. It is hardly surprising that governments, hard pressed for immediate credit to subsidize indispensable short-term programmes, tend to sacrifice long-term objectives, among them forestry.

Forest services should make every effort to secure long-term financial commitments commensurate with the investments required by forestry policy. The minimum commitment, not always conceded, should provide for reinvestment of a sufficient percentage of forest income.

Obviously, foresters will often be

disappointed by the amount allotted to them in the state budget. They will therefore have to obtain the support of other keepers of the public purse. Forestry financing usually comes from these sources:

- Allotments from the state budget.
- The appropriation of specific taxes.
- The appropriation of all or part of the proceeds of the sale of commodities produced from state forests, and revenue collected for concessionary rights.

These three sources can either be combined to furnish a global budget for the forest service, or be allocated to specific activities of the service.

General budget financing is particularly appropriate for works that benefit the entire community but do not yield direct revenues, such as protecting the environment, providing facilities for recreation and tourism, etc.

Taxes

Finance from specific fiscal or semi-fiscal taxes imposed on the sale of wood and other forestry products is highly suitable for meeting the needs of production development: forest equipment, reforestation, etc. Imposing and manipulating such taxes is a delicate matter, and one that can have negative results. Yet, if wisely conceived and handled, this can be a flexible, efficient instrument in the foresters' hands, especially if properly identified within a special fund, entirely reinvested in forestry development, along the lines of the French National Forestry Fund.

Appropriation of all or part of the proceeds of the sale of forest products can accrue to the assets of "supplementary forestry budgets" or to those of public agencies responsible for forest management.

The advantage of appropriating taxes and revenues is that these are more likely to assure the continuity and regularity of forestry work because they bypass fluctuations in the general national budget, and are not so sensitive to political hazards. They are also more effective than the traditional budgetary system in encouraging forest services to pay close heed to the economics of forestry production, and to interest themselves in the "down-

stream" industries and their outlets.

Some governments have acknowledged that the forestry enterprise must resort to methods that do not differ fundamentally from those of other public — and private — enterprises. They have therefore set up various bodies, limiting their scope to business administration, and sometimes adding functions that come under the jurisdiction of the administrative authority.

The latter is exemplified in the "commission" approach, with the British Forestry Commission as its prototype. Directed by an administrative board, including public and private figures besides its officials, it collects the income of its commodities, receives subsidies or loans from the treasury, acquires land needed to extend the state's forestry holdings and exercises all the duties of the forestry authority, including supervision of private forests.

State corporations, in the Anglo-Saxon countries, and *corporaciones*, in the Hispanic countries, are public bodies founded for industrial or commercial purposes. Usually they are obliged to turn over their cash surplus to the state budget. They are paid according to the importance of the services they render, and cover all or part of their expenses with the proceeds of their sales, eventually resorting to public funds only when necessary. Their activities, subject to the laws of the market, are supervised by the legislative and executive bodies. This supervision may be exercised particularly over the prices which the corporation charges for its products and services, to keep them in line with the state's overall economic policy. Their accounts are kept as in any commercial company. They can receive and grant commercial credits and hold considerable liquid funds in ordinary banks.

They are statutory bodies set up to execute state policy, and must use the independence granted them, notably in financial matters, for the purposes explicitly defined by their national mandate.

Some forestry activities, particularly silviculture and the processing of wood, could conceivably be entrusted to autonomous public or semipublic bodies. These agencies are required

to orient their activities toward specific objectives assigned to them when they are founded, and to account for their performance. They receive some state directives, but differ from state enterprises in that they are exempt from detailed supervision.

In a different direction, the state can affiliate with private enterprise, either as a shareholder in private companies or by creating mixed public and private companies. Customarily, the state holds the majority of shares, the rest being subscribed to by public or private groups or private persons.

Both kinds of undertaking — forestry authority and commercial enterprise — can be assumed by a single forestry organization, either an administration or a public company juridically separate from the state. Alternatively, they can be assigned to separate organisms: to a forest service and to one or more public or semipublic agencies more concerned with commercial functions.

The separation is not always so clear cut, but the administration can, if necessary, transfer some of its functions to semiautonomous agencies operating under the supervision of the relevant government ministry and in close contact with the forest service. Or else the service can affiliate with producers and manufacturers through joint or "mixed" companies.

No single answer

The question will arise: should a country opt for a simple structure of the "single forest service" type or for more diversified structures?

There is, of course, no universal answer. The formula entrusting all works "of authority" to a forestry administration along with the management of the state forestry domain is always a valid one, offering the expedience of simplicity and unity. Cropping, processing, marketing and promotion of forestry commodities are then taken over by private enterprise. If this system is chosen, the state service should maintain a sharp watch on its collaborators in order to safeguard the nation's long-term forestry interests, and sometimes its ecological welfare as well.

Even when the major share of utili-



IN A THAILAND TEAK PLANTATION
growing capital

zation is left to the private sector, the administration might usefully set up its own silvicultural sector under state control. Since this sector must compete with private companies, the dual operation would give the forestry officials a better understanding of constraints and actual production costs, and hence more accurate control over the felling done by professionals. In addition, a state-supervised system can recruit and train a permanent labour force, and thus help improve employment conditions in the rural sector.

In any case, an exhaustive study of forestry policy, which will enable the responsible authorities to familiarize themselves with its manifold aspects, will soon reveal which type of organization meets all requirements, from the initial to the final stages of development. The choice of diversified structures will be dictated by the advantages afforded by specialized services and personnel, an approach that will help to identify those areas which the administration is ill-equipped to deal with on its own. For example, utilization and marketing may best be handled by a public company whose methods and management are much closer to private enterprise than to an administrative service.

Such an organization can be recommended when private enterprise is inadequate, too difficult to supervise, or too much given to questionable practices, which can imperil the future of the forests. In this case, the state could either set up public enterprises in competition with the private sector or grant a monopoly of forest resources development to a large company, thus creating opportunities to rehabilitate or rectify the "economic" activities connected with the forest. In a parallel move, it can gradually create specialized enterprises to undertake wood processing, and also handle the sale of their output, semifinished or finished.

Exploitation of the forest's potential for tourism and recreation, including hunting, could substantially benefit the economy of some countries, and therefore warrant the establishment of specialized public agencies for this purpose. Thus, no additional burden would be placed on the administration in charge of management, which

should concentrate its efforts on other important goals, such as conservation and the business of producing wood.

Thus we end up with the concept of a forestry administration in authority, possibly also responsible for management, while one or more public enterprises assume the industrial, commercial and, where appropriate, "tourist" functions.

If a complex organization is chosen, however, various pitfalls will present themselves. First of all, dispersion of policy responsibilities can impair effective coordination of activities, and weaken the overall authority a centrally planned forestry administration will want to exercise.

Personnel

Again — and this is the greatest risk — a complex organization will not work effectively if the number of qualified personnel the country has managed to mobilize is not sufficient to man the structures soon enough. Consequently, years may pass while vacancies are filled only in the central administration and in the big cities. Forestry action cannot be efficient unless regional and local staffs and qualified forestry workers, whether for state or private activities, are doing their job in the field.

The distribution of personnel in the field too often conforms more to past requirements, no longer valid today, than to a rational analysis of current forestry needs. For example, the outmoded patterns of personnel distribution may persist in spite of profound changes in means of communication, transport and urban development. In many cases extensive redeployment of field personnel will be urgently needed, whatever the structure adopted may be.

The foregoing reflections will possibly help decision-makers in the developing countries — and perhaps in other countries as well — to diagnose their national forestry situations by seeking the answers to the following questions:

Do their domestic administrative structures fulfil the needs of the national community?

Do those structures make the most of the nation's forestry development potential?

Pierre Terver

MISSION TO

The great drought which has prevailed in the Sahel since 1972 has led the international community to give emergency aid on a massive scale. It has also shown the need for a reappraisal of the problems of the Sahel. It has become clear that the inquiry should be set in a wider context, going beyond mere considerations of protection. In particular, it must take into account the necessity for ensuring the economic and social development of the countries in question, based on well-planned and well-organized government and external assistance activities.

At a meeting of the FAO Forestry Commission for Africa held in Nairobi in February 1972, the Upper Volta, Mali and Senegal delegations asked FAO to help them, by means of surveys and projects, to solve the serious problems of the advance of the desert and soil erosion in the Sahelian zone. The Swedish International Development Agency (SIDA) immediately expressed its willingness to take part in such activities, under the aegis of FAO, and to pay for a first FAO-SIDA Mission to inquire into these problems on the spot.

An international committee was set up to combat the Sahelian drought — Comité permanent inter-états de lutte contre la sécheresse au Sahel (CILSS) — and one of its first moves was to find out from the governments of the countries concerned how they expected surveys and projects to be carried out. At a meeting at heads-of-state level in Ouagadougou, Upper Volta, a cooperative organizational structure for the work was arrived at for the Sahel as a whole. The Mission was also expanded to cover Mauritania, Niger and Chad, in addition to Upper Volta, Mali and Senegal.

The importance of the FAO-SIDA Mission to the Sahel lies in its multidisciplinary approach to land protection combined with the agricultural development of an extensive, fragile, complex combination of ecosystems spanning a vast desert and semidesert area. It is this which the author, who headed the Mission, describes.



SAHEL LANDSCAPE AT 300 METRES ALTITUDE
to manage this land

THE SAHEL



SEA LEVEL, WITH ROCK OUTCROPPINGS (JABELS) IN BACKGROUND
of different disciplines will have to get together

It has long seemed to me that research aimed purely at environment protection was open to question as a development goal. But in the Sahel the necessity of protecting the environment and safeguarding the ecology is clearly a factor upon which development depends. Despite the uncertain agricultural productive potential of the Sahel it must provide a livelihood for not only the present population but for future generations as well. The need to increase agricultural development, the need to protect the environment at the same time, and the short-term and long-term approaches which can sometimes be at odds with each other, are all parts of the Sahelian problem.

Both FAO and SIDA listened sympathetically when I discussed these problems, and consequently the original terms of reference of the Mission to the Sahel were revised, making it more interdisciplinary and permitting study of the overall ecology, forestry and land protection aspects with a reasonably long-term development outlook.

Camaraderie

This having been done, the Mission went to the field. There our broad, long-term approach was sorely tested, first of all by the directors of national forest services. Their initial reaction was one of frustration and I, originally a forester by profession, could only sympathize with them. The international *camaraderie* of foresters is not an empty expression; it does make it possible for foresters to exchange ideas with great frankness and understanding. The difficulties faced by forest service directors in the Sahel are real. Nonetheless, they recognized the soundness of our arguments and they understood the need for an integrated approach. For all of us it was a matter of making the kind of synthesis that would facilitate the solution of complex problems. In broad outline, this is what we agreed upon.

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None of the factors which influence the problems in the Sahel — and no development project in this part of Africa — can be studied or dealt with in isolation. All are components of a single, large complex. The end purpose of our efforts should be neither ecological equilibrium nor technical-economic development, but rather the saving of human lives and the assurance of the future survival of the peoples of the Sahel.

Beyond the Sahel

The major characteristic of the Sahel — a very low and extremely precarious potential for agricultural production — led us to consider the area not simply as a marginal zone but rather as the “back country” for more affluent and often ecologically complementary areas. For this reason we saw the need to replace the idea of a strategy for the Sahel alone with one of overall land development and soil management going beyond the Sahel. This, we felt, would afford the opportunity to undertake a whole

series of projects aimed at economic integration of the dry Sahel with ecosystems within it having a high productivity potential — the Senegal and Niger river valleys and the Chad basin, on the one hand, and the Sahel and complementary adjacent zones (the Sudan-Sahel and the wet tropics) on the other.

Our point of view was also formed in the light of certain errors in land management which had been made in the past. They were understandable mistakes because they had been made under the pressure of crisis and emergency. Nonetheless, they led us to condemn all local or sectoral action programmes or projects not conceived as part of a combined environmental protection and development plan, or which could not be fitted into such a coordinated approach.

The kind of errors of the past which we hoped to see avoided in the future involved uncoordinated, haphazard drilling of wells, piecemeal measures in the raising of livestock, a food production policy aimed at self-sufficiency, and similar mistaken actions which re-

sulted in vegetation cover and land being increasingly degraded even to the point of localized desertification. Conceived as short-term benefits for specific sectors, such moves proved in the long run to be failures. Consequently, it was now appreciated that the Sahel needed coordinated management policies for grasslands and livestock raising, agriculture, forestry and pisciculture, and that such policies had to be formulated and carried out while not neglecting the needs of the people and the realities of heavy population pressure on the land in certain areas.

A broad plan

The vastness of the Sahel and the rapid and progressive degradation of the land, combined with economic and technical difficulties and the uncertainty of the long-term impact of projects, led us to seek an approach which would balance costly environment protection projects with measures aimed at agricultural production.

As regards environment protection work, therefore, there was no question

How do you define the Sahel?

It is not easy to define the Sahelian zone of West Africa. Sahel is an Arab word meaning coast, or by extension an edge or border. It is used to designate the belt of land which borders the southern part of the Sahara desert, from Mauritania to Chad.

The FAO-SIDA Mission¹ to the Sahelian zone (October 1973-January 1974) defined the area as being characterized by summer rainfall, a long dry season of eight to nine months, and with the general appearance of steppe land with trees or shrubs. In addition, it is a zone in which the main occupation is pastoral. Its agriculture

is principally devoted to cereal crops. Both these forms of production are particularly subject to climatic hazards.

The following are some of the basic characteristics of the Sahelian zone as summarized from the report of the FAO-SIDA Mission.

Climate

Climatic parameters are among the criteria which are employed to delimit the ecological zones of the Sahel and adjacent areas. Use is made in particular of mean annual rainfall figures. The Sahelian zone proper is often divided into two parts, one with a mean annual rainfall of 200 to 350-400 mm, the other with a mean annual rainfall of 350-400 mm to 600 mm. A rainfall of 350-400 mm sets the limit, more or less, for dry farming.

The general appearance, agriculture

and mean annual rainfall of the Sahelian and adjacent zones of the whole area are as follows:

Saharan-Sahelian zone (100-200 mm): Very sparse shrubby vegetation. No cultivation.

Sahelian zone (200-600 mm): Predominantly pastoral zone, but with important cereal crops, principally millet (between 300 and 600 mm) with some sorghum; groundnuts present but production unreliable.

Sudano-Sahelian zone (600-800 mm): Cereal crops predominant; more sorghum than millet; groundnuts widely cultivated; cotton present, but production unreliable; livestock still numerous. In both the Sahelian and the Sudano-Sahelian zones varieties of sorghum and millet with short growing periods are predominant.

Sudanese zone (800-1 200 mm): Many and varied agricultural activi-

¹ The Sahelian characteristics given here may be found in Chapter I of *Report on the Sahelian Zone*, a survey of the problem of the Sahelian zone made with a view to drawing up a long-term strategy and a programme for protection, restoration and development, FAO-SIDA Mission, FAO, Rome, 1974.

that action was required throughout the area, on a very large scale and all at once. In order to do this and at the same time keep within the realm of the possible and the practical, an overall plan had to be laid out, then broken down into its component parts and finally phased over a period of time. Priority action projects were selected in the light of the acuteness of the land degradation, as well as on the basis of their relationship to overall development.

The Sahel covers six politically independent countries — Senegal, Mauritania, Mali, Upper Volta, Niger and Chad — which, although linked together through the CILSS pacts, do not individually possess the kind of resources required to effectively implement a single, integrated, interdisciplinary protection-cum-production plan. It was essential that each of these countries frame its own national forestry policy and plans which should follow guidelines on which they all agreed.

Within the framework of such a policy to cover all the Sahel, the Ouaga-

dougou Conference had agreed upon "Operation Green Front." This aimed at the modification of the macroclimate and the setting up of barriers in the path of the north-south advance of the Sahara desert. Man-made tree plantations and reforestation projects were to be undertaken. But the Mission also felt that it was necessary to confirm some long-standing observations concerning the advance of the desert. There appears to be no proof to support the theory of a frontal advance of the Sahara resulting from climatic factors, while it is certain that desertification attributable to man's influence and impact on the land is increasing in specific places within the Sahel as well as at great distances from the fringe of the Sahara.

Mosaic pattern

The Mission agreed that it should advise CILSS and the governments of the Sahel countries to plan land development in such a way as to replace zonal protection projects with a series of local efforts. Such a mosaic pattern

of action projects should not be confined to man-made plantations alone, but should be diversified to include the setting aside of reserves for protection purposes, the fixation of continental sand dunes and afforestation under special management — for example, combined forestry-pastoral projects, the growing of dum palms (*Hyphaene thebaica*), *Borassus* palms (*Borassus aethiopum*) and rubber tree plantations. Above all, the planting of trees on croplands and around pasture lands should be encouraged in order to create improved conditions for both crop and livestock production.

This brings us to the concept of rural land development and the coordination of sectoral policies, keeping in mind the need for combining protection and production.

Foresters know from long experience that forest which is intended for timber production is easier to safeguard from the damaging influences of man and his livestock than forest intended for protection purposes. The so-called "green polygon of the Niger," discovered by the Skylab satellite, is an

... by rainfall, people and vegetation

ties; cash crops compete with maize and with varieties of sorghum and millet with long growing periods.

Guinean zone (over 1 200 mm): Represents only a small part of the Sahelian zone countries studied by the Mission: Senegal, Mali and Upper Volta. Because of the two-peak rainfall distribution two cultivation seasons and a greater variety of crops are possible.

Other limits have been proposed, especially for the Sahelian zone, which has sometimes been put between 100 and 500 mm isohyets, and sometimes between 100 and 600, 100 and 400, etc.

The lower limit for the Sahelian zone could in fact have been put at 100 mm without this making any difference to the Mission's observations.

Rainfall represents only one aspect of the climate. Other factors such as continentality also play a part and

may modify the local characteristics of zones which have the same rainfall. Bearing these reservations in mind, the Mission found that the limits of the zones as given above were satisfactory. They are sufficiently broad, and in addition they agree with the ideas of the local technical experts.

Ethnic make-up

The opinion has sometimes been put forward that the Sahelian zone could be defined by the presence of pastoral tribes. Although these people are there in large numbers, we may also in fact note the presence of predominantly agricultural villages such as those of the Soninke, Bambara, Sonrai, etc., right up to the minimal limits of the zone, while some pastoral tribes, such as the Fulani, are found at the present time in places well

outside the zone, in Dahomey, Cameroon and Ivory Coast. The Mission has, however, noted the interest which all the tribes take in their livestock.

Plant life

Some writers have noted certain plant species as being characteristic of the Sahelian or Saharan zones. The Mission, however, has not accepted that it is possible to identify each zone by a single characteristic species, given the diversity of the plant cover and the existence of special edaphic environments — for example dunes or temporarily flooded areas — which may take plant species far from their normal distributional range. Nevertheless, each of the ecological zones noted above has its list of preferred species.

illustration of the kind of protection which can be obtained, however, when there are vested economic interests involved. Nevertheless, in rural land development projects, such as those under consideration here, man-made stands created for environmental protection are often the only solution, in spite of their high cost and the technical difficulties involved in establishing them.

From the technical standpoint, tremendous strides have already been made thanks to forestry research. But such research needs to be pursued. Accordingly, the role of an "Institute for the Sahel" was discussed.

Many difficulties in the field still need to be solved. The choice of project sites will certainly depend on technical necessities, as will also the satisfaction of the requirements of human beings and the quality of their lives. Should it be possible to integrate a forest stand, even one primarily established for industrial purposes, into an overall plan for suburban land development with recreational facilities, its cost would be more readily justified. In the Sahel such combinations are possible. For instance, near villages, and especially near large cities, there is great need for firewood, and the possibilities for combining woodlots and protective stands are obvious. In all this work, whether it is a question of plant nurseries or actual tree plantations, one of the main factors for achieving success, not only from the technical but also from the financial standpoint, will be the availability of skilled manpower. Having tree nurseries which produce sufficient numbers of seedlings for planting by specific deadlines would avoid heavy losses due to failure of plants to take hold and would eliminate costly watering.

Usually, of course, the forest services require assistance. But it is best if outside assistance, adapted to the actual circumstances, is provided for training purposes during the project execution stage in the field.

Not in isolation

The Mission could not be expected to make revolutionary technical discoveries in the field of forestry in the space of a few months. What it could



A MAN-MADE DESERT WINDBREAK
another kind of forestry

be expected to do was to compile, collate and insert into the picture of what was possible and feasible innumerable bits of knowledge and pieces of information collected over several decades of experience. What appeared to us most important, and what we stated and forcefully repeated, was that in the Sahel nothing can be done separately, in isolation, by itself, and that no one can work alone whether in forestry or in other disciplines. Are we suggesting that forest services, their forestry officers and technicians disappear, and be replaced by multidisciplinary services and agents? Most categorically, no! The competence, technical knowledge and experience of these forest services and their staffs are absolutely indispensable for the survival of the Sahel. But what is equally essential is that these services

and their officers should learn to think and to work in close cooperation with their colleagues in animal husbandry and agriculture, as well as with ecologists, economists and sociologists who should act as permanent advisers and consultants. Furthermore, this must be done at all levels, out in the field, among the higher echelon staffs of the various technical services and among the top-ranking planners and managers of national and regional soil management and land development work. In addition, it is essential that there be foresters among the higher echelon staff participating directly in final decision-making. Foresters are among those best acquainted with the Sahel, its peoples, and their capabilities and aspirations, and who best understand the recent disaster in human as well as in technical terms. ■

The new look of African education

How is forestry education developing and likely to develop in African universities? Not, says the author, according to the patterns of forestry schools in developed countries. Curricula are being dictated by Africa's own social and ecological needs and realities. He describes new directions which are being taken and explains why.

Laurence Roche

Man looms large in Africa, he is at the centre of the stage, and he still has many options open to him — philosophical, ecological, social and economic. He is currently exploring these options. It is against a background of social flux, institutional innovation and development that I propose to paint with a broad brush the picture of trends and issues in forestry education in Africa as I see it from my vantage point. Emphasis, however, will be given to the role of forestry in socio-economic development and the eco-

logical balance of the human environment in Africa, for it is only when this role is understood that numerical projections in forestry education in Africa become meaningful. For a rather different though complementary treatment of the subject, and a more detailed analysis of traditional forestry education, particularly in regard to student intake and the needs of industry and government agencies for professional foresters, the reader is referred to Hilmi (1971), Richardson (1969), Lafond (1969), Wyatt-Smith (1969), and FAO (1969).

Trends and issues in forestry education in Africa cannot be considered in isolation from the ecological, social and economic realities prevailing in nonindustrialized societies generally. If they could, then we might be satisfied with training graduates to spend the rest of their lives producing and

processing cellulose rather than educating men and women to play a broader role in nation building.

Educating men and women to play a broader role in nation building is a fine-sounding concept, and it might be said that it is no more than that, and that it produces no cellulose, let alone carbohydrate and protein. An alternative view, however, is that such a concept is more than just fine-sounding, that on the contrary it is a practical option in forestry education in modern African states. I share this latter view.

In *Only one earth: the care and maintenance of a small planet* by Barbara Ward and René Dubos, a book originally commissioned by the United Nations Conference on the Human Environment, there is an enlightening chapter dealing with policies for growth in nonindustrialized societies. This book incorporates the views of more than 70 scientific and intellectual leaders from 58 developing and developed countries, and should be mandatory reading for all students of natural resource management. The following quotation from it is, I believe, profoundly relevant to forestry education in Africa:

Large substitutions of scarce and concentrated capital for abundant labour are economically and ecologically unsound for a variety of reasons. In the first place, the small owner, working with his own labour on a family holding, has been shown in a wide variety of developing countries — India, Brazil, Kenya, Colombia — to produce more per acre than the bigger estate. Some of the highest yields are to be found in countries where acre limitations are strictly enforced. This productivity is secured not by heavy machines which drink gasoline and can easily damage fragile soils but by hand work with light equipment which is, by definition, less prone to generate ecological risks. Fertilizers and pesticides are less lavishly used, humus and animal wastes more carefully husbanded. Greater personal care keeps terraces in trim, shade trees planted, gullies forested. And earnings are not spent, as is so often the case in semi-feudal economies, on acquiring more land for extensive use, thus pushing up

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land prices and driving more working farmers away from the soil. Nor are they withdrawn altogether from the rural economy by the development of "western" standards of conspicuous consumption . . .

The authors of the book go on to point out:

The "Green Revolution" needs to proceed within a social framework of land reform and popular participation which provides maximum employment and the optimum distribution of gains from the new productivity. Next, its highly sophisticated methods need to be, as it were, "encased" in the context of extension services, agricultural research, farmers' training centres, adult literacy and strong supervision which, for instance, permitted Denmark in the nineteenth century to develop Europe's most productive agriculture around small farms, cooperatives and people's schools.

Next, this framework of expertise needs to be profoundly rooted in the environmental realities of local soils, climates and plant varieties and take into account all the traditional wisdom that practical farming has developed over the millennia. The kind of ecological "mix" that is required is not one that can be brought in readymade from highly mechanized temperate farm systems. It is the combination of modern science with local inventiveness and local responsibility that is ultimately at the core of the only really effective and sustainable ecological balance . . .

If a graduate in forestry in Africa is nothing more than a producer and processor of cellulose, then, of course, his role in relation to the socioeconomic development of his country is severely limited. The fact is that however misdirected his education, and however unrelated it may be to the ecological, social and economic realities of the land in which he lives, these realities propel him on graduation into a wide spectrum of tasks related to natural resource management rather than forestry in the more narrow sense.

Graduates of the Department of Forest Resources Management of the University of Ibadan, for instance, may find themselves on graduation involved

in the setting up and management of game reserves; in supervising the sowing of large quantities of maize and cassava, and the subsequent harvesting, processing and marketing of these crops from departmental taungya systems; in the establishment of pulp and paper plantations in the rain forest region, or shelterbelt establishment in the savanna regions of the north. Invariably in the execution of their duties they are called upon to perform tasks to which the more traditional forms of forestry education are only marginally related, and which require for their successful completion in an African context that combination of modern science, local responsibility and local inventiveness referred to by Ward and Dubos.

Farm-forest

The environment of the vast majority of people in African nations is still that of farm-forest, and, no matter what their duties, this is the environment in which graduates in forestry generally find themselves on leaving university. Rarely are they able to isolate themselves from the daily problems of living which beset the rural people about them.

The role that the forestry graduate can play in the development of this environment is now evident, as the need for controlled centres of rural growth sustained by a diversity of industries based on natural resources, such as forest industries, is increasingly recognized by African governments. The growth of one or two massive urban-industrial complexes divorced from the land, its resources and its people, and sustained by an alien technology, and an alien social structure, has failed to provide a just distribution of the fruits of development in many countries of the world, including Africa (see Mabogunje, 1974, for a penetrating analysis of this problem in Nigeria), and a significant shift toward the rural economy is now evident.

The options for development are, therefore, still very much open in Africa and this fact must exert a powerful influence on forestry education in African nations.

Forestry education at a university level is a very recent innovation in

Africa. It is still in its infancy, and confined to a very small number of countries. Therefore, it is not possible to examine a variety of approaches to forestry education on this continent. The Departments of Forestry now being established in Uganda, Tanzania and Zaire are still in the earliest stages of development, and, with the exception of Uganda, still heavily dependent on expatriate staff, and far from accepting and implementing a preconceived philosophy of education in this field. Although an older institution, it can be said that the School of Forestry in Liberia is also in the early stages of growth and development.

The Department of Forest Resources Management at Ibadan has gone beyond the establishment phase, and is now in a vigorous phase of expansion and diversification under the impetus of a predominantly Nigerian staff, increased student enrolment, and the requirements of 14 state and federal departments of forestry. The Department is one of the three main divisions of the Faculty of Agriculture, Forestry and Veterinary Science. A recent proposal to change the name of the Department from the original "Department of Forestry" to "Department of Forest Resources Management" has been approved by the Senate.

An open door

The Department attracts students from all over Africa, both undergraduate and postgraduate, and also from certain overseas countries. At the present time, total student registration in the Department is 93. It has 20 established senior staff positions, of which less than half concern forestry; the remainder embrace a wide spectrum of related resource management disciplines, including wildlife management, range management, and freshwater fisheries management. This number is augmented from time to time by visiting staff from other universities. There is a supporting junior and intermediate staff of 24.

For these reasons it may be of value to sketch in broad outline certain aspects of the mandate in teaching and research in the Department at Ibadan as my colleagues and I see it. It is

not proposed to outline all aspects of forestry and resource management disciplines which are of concern to the Department, but to touch only on those which illustrate the potential of forestry and related disciplines as instruments for rural development and

taking place throughout Africa, and nearly always at the expense of species-rich high forest, or savanna woodlands. Usually they are established by the state within forest reserves. In the southern states of Nigeria the peasant farmer is given the

Gmelina arborea. The work is done by departmental labour, resulting in the Forestry Division being the single largest food producer in the State.

As it is practised in the Southeastern State, taungya can be considered a mixed cropping system with an important component of the mix being a wood-producing tree species. We are studying this system very closely at Ibadan, in cooperation with the State Forestry Division and local community leaders, with the objective of demonstrating its value to small farmers outside the reserves. At the present time there seems no reason to believe that a short-rotation (less than ten years) commercial tree crop (for wood) could not replace bush fallow outside the reserves.

Toward change

If this can be demonstrated, then the results could have far-reaching consequences in rural development. Private enterprise forestry would be introduced to the smallholder, who for historic reasons assumes that forestry is a government monopoly, and bush fallow, so wasteful of land, would be replaced by a cash crop in the form of salable wood which could provide that extra economic impetus required to lift the farmer from subsistence agriculture. The Forestry Department of Ibadan is looking into all aspects of the matter, including appropriate species mix, length of rotation of tree crop, soil fertility following cropping, socio-economic implications, and the establishment of small-scale wood-using industries such as charcoal burning, sawmilling, etc., which could be integrated with the private woodlots.

The development of a sustained yield tropical agroecosystem (Jansen, 1973), such as that referred to here, requires above all an holistic approach that is not possible within the framework of traditional forestry practice, but which ought to be the norm in schools of forestry in nonindustrialized countries such as those of Africa. Taungya is, of course, part of the traditional forestry practice in many parts of the tropics. It was not, however, developed for the benefit of local people but for state forestry divisions seeking to establish commercial plan-



NIGERIAN STUDENTS LEARN TO USE A THEODOLITE
it looks good for forestry

rural prosperity in Nigeria. Thus, for example, rather than discussing the well-known and vitally important problems of management of large, single-species industrial plantations of exotic trees which are being established in Nigeria and many other parts of Africa (and which are, of course, of major concern in the teaching and research programme of the Department), what will be discussed is the possibility of establishing and managing at least some of these plantations in such a way that they may have greater and more immediate relevance to the socio-economic development and ecological balance of the human environment in Nigeria.

The establishment of large single-species plantations of exotic trees is

opportunity to farm inside the reserve in return for clearing the logged-over, although usually still heavily wooded, forest, and planting fast-growing exotic tree species together with his own agricultural crops. After about three years, depending on the tree species used, the tree crop closes canopy, the farmer is given another area, and the cycle is repeated. In this way more than 20 000 acres (8 000 ha) of forest reserve land are made available each year for farming. This system is traditionally referred to as *taungya*, its Burmese name.

In the Southeastern State imaginative policies have led to the integration of taungya on a sustained yield basis in the management plans for large industrial pulp and paper plantations of

tations at minimum cost. Little or no thought was given to the production of a sustained yield of food and wood by the working group following the establishment and harvest of the initial plantation.

Wildlife for protein

Charter (1973) has provided an analysis of statistics on the economic value of wildlife in Nigeria. The overall averages for locally produced animal food in the rural areas of southern Nigeria indicated that about 19% was obtained from wild animals, 60% from fish, and only 21% from livestock. Nationwide consumption of bushmeat was valued at 20.4 million naira (US\$34 million) in one year, and all meats from domesticated animals at 26 million naira (\$43.3 million). The highest percentages of bushmeat consumption relate to areas in or near forest reserves (e.g. Benin 82%, Uyo 84%, Calabar 80% and Ondo 67%).

There are a number of striking features about these statistics which will not be discussed here. It is perhaps sufficient to observe that if an unmanaged natural resource, which has been massively depleted, can yield the bulk of the protein consumed by large numbers of rural people, a much greater yield can be expected under management. This observation applies as well to fish resources.

The setting up of game reserves and the protection and management of game is now a major concern of the forestry divisions of each of the 12 States in Nigeria, and it seems certain that Nigeria's wildlife heritage will be conserved and managed for all time. One question that concerns us at Ibadan is: conserved for whom? Thus, although the Department is involved in most aspects of wildlife conservation and management, it is particularly interested in those aspects which relate to rural development, such as the domestication of small mammals already widely utilized for food in rural areas, and cropping in game reserves for the benefit of local people.

A study of food balance sheets for many nonindustrialized countries would indicate that the quantity and quality of food available for consumption are far below that necessary for

good health. Yet it is also a common observation that the people in many of these countries, particularly in West Africa, do not appear to be suffering from hunger and malnutrition (Nicol, 1972). The fact is that the natural bounty of forests, woodlands, lakes and rivers, where these exist, supplies a massive amount of protein and carbohydrate unrecorded in these food balance sheets, and generally neglected in plans for increased food production in the tropics.

A little of this has been touched upon in discussing wildlife as a source of protein, but there is also a casual

the Department at Ibadan is now initiating genecological studies of food-producing trees in Nigeria. Okafor (1974), a pioneer in this field in Nigeria, has pointed out the great importance in the diet of rural peoples of the fruits and seeds of such tree species as *Chrysophyllum albidum*, *Dacryodes edulis*, *Irvingia gabonensis*, *Pentaclethra macrophylla* and *Treculia africana*, and has observed that their large-scale production will certainly enhance food production in the country. These studies will eventually be extended to food-producing trees of the drier northern savanna regions,



IBADAN UNIVERSITY STUDENTS AT A WOOD TREATMENT CLASS
from all over Africa

and daily harvest of fruits, nuts, leaves, twigs and bark, which are common ingredients in a variety of traditional dishes in Africa. Anyone who has lived in Nigeria will have observed this.

It is against this background that

e.g., *Butyrospermum parkii*, *Parkia clappertoniana*, and to other trees which are sources of commercial products of importance in the rural economy of the north.

The object of these studies is to provide essential information concern-

ing their distribution, their vegetative and reproductive cycles, and the extent of genetic variation within the species, which is a prerequisite to domestication.

These, then, are examples of the Department's teaching and research programme, taken to illustrate the manner in which some of the precepts touched on in this paper may be put into practice. It is stressed, however, that they are but aspects of the Department's programme, which embraces a spectrum of forestry and related renewable resource disciplines too wide for discussion here.

It is obvious that the development of a teaching and research programme in renewable natural resources management that would effectively embrace such activities as those outlined here requires a four-year degree programme, and not three as is currently the case at Ibadan. In the fourth year a combination of courses can be offered for each of the major resource management disciplines for which the Department has professional competence. Discussion on this matter was initiated by Wyatt-Smith (1966). It is now well advanced, and a four-year degree programme will be introduced at Ibadan in the near future.

Basic needs

This article has been concerned with trends and issues in forestry education in Africa rather than forestry education *per se*. Therefore, some major aspects of forestry education have not been dealt with. It must be emphasized, however, that sophisticated expertise in all aspects of silviculture and management of large industrial plantations, in the management of remnants of natural forest ecosystems, in wood utilization, forest economics and forest engineering will be required to an increasing degree in Africa. The major thrust of a university's teaching and research programme in these fields must be to provide this expertise.

The University of Ibadan has an Institute of Applied Science and Technology which offers degrees in wood engineering and forest engineering. These require a strong background in mathematics and the physical sciences. The Department of Forest Resources

Management is therefore able to concentrate, on the one hand, on those subjects (e.g., wood anatomy) which relate to wood as a product of industrial biology, that is, influenced by breeding, site treatment, spacing and provenance, and on the other on those subjects that relate to sustained yield and the stability of the ecosystem, natural or man-made.

This division of effort is desirable where possible in Africa, as wood engineering and forest engineering are seen to fall more appropriately within the ambit of an engineering curriculum than one concerned with forestry and related renewable natural resource disciplines. This, of course, does not mean the exclusion from the Forestry Department's curriculum of those subjects in wood science and forest operations which occupy a zone between the biological sciences on the one hand and the physical on the other, and which have been mentioned in the last paragraph.

Highly efficient and competitive forest industries can and will be established in African nations. Furthermore, they can be established without neglecting the profoundly important aspects of forestry touched on in this paper, which relate so directly to the socioeconomic and ecological realities of African nations and to the professional calibre and social awareness of the young men and women who graduate in this field from African universities. ■

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BEHIND THE BILL OF SALE

J.T. Wassink

Everybody knows more or less what the word marketing means, but not everybody realizes that in the field of distribution of goods from producer to consumer it stands for *a series of actions such as collecting, grading, sorting, storing, transportation and contacting the client*, all leading to the ultimate goal: effecting a sale.

The sale is the important factor, but when the prerequisites are not efficiently handled the sale never materializes or leads to disappointments for both the seller and the buyer. With this in mind, I would like to analyse the consequences of the different actions which go into the marketing process for imported timber.

What should be collected? Timber, surely, but the potential choice is so wide that we need yardsticks to decide what kind of timber to purchase. Therefore we have to investigate what the consumer wants.

For the bulk of timber at present used some of the most desirable properties are:

1. It should come from large trees, thus promoting efficiency during sawing.
2. It should be available in quantity. Since this concerns bulk, the turnover

may consequently become very large.

3. It should have reasonably high mechanical/physical properties.

4. The workability should be good.

5. Less stringent, but still of great importance, it should preferably have a coarse grain.

6. Although different markets have different wishes, there is a general preference for reddish-brown timbers. Golden yellow is also much in demand and pays a premium.

7. Radial and tangential shrinkage should be minimal or at least in proportion to each other.

8. It should have an attractive figuration. This is a subjective factor which differs with markets and fashions.

Lowering the price

Timbers that do not comply fully with the above list can also be sold, but the outlets for them are in selective markets only. These markets have to be scouted out or created. Local or known uses can be a good starting point. It is too often forgotten that a market can be created, either by using imagination or by convincing a customer who has specific demands to put aside some of his specifications. In such cases low price is a major factor, such as when a sawmill has a lot of so-called waste (sapwood, for

instance) that can be sold at a minimum price. A good deal of imagination and initiative is important here.

Besides knowing what to collect, it should be decided where to collect. Ideally, one should collect as near as possible to the place of arrival of the shipment. The price of the timber and the price of transportation are important. Collecting in a concentrated area is preferable to collecting at scattered points, since transport is then easier to organize and cheaper with bulk handling.

Collecting should be done in good time, the goal being to accumulate a good store of merchandise in order to guarantee prompt delivery.

The man who buys the timber in the forest should have a thorough knowledge of the type of timber his organization is able to sell. He should know a great deal about the specific demands for the timber from the point of view of the industry working the timber. He should always realize that, in fact, he is buying timber for the consumer.

The transportation flow should be regular and steady, with the fewest possible interruptions. Only in this way can the organization of harvesting, transportation and handling at the receiving point be an efficient operation. This includes the realization that climatic conditions may influence the

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timber marketing involves analysis of information, understanding transport, storage and industrial technology, gaining the confidence of buyers and creating new markets for unknown species of wood



TIMBER BEING MOVED INTO A LOADING POSITION IN THE BRAZILIAN PORT OF SANTOS

please come on time

operation strongly and the organization should be flexible enough to turn smoothly to alternative possibilities. The provision of adequate and reliable means of transportation is an important part of this flexibility.

Delivery from storage should be on a "first in, first out" principle in order to prevent degrading of the merchandise through long storage. It may be

necessary to prevent degrading by artificial means, such as water-sprinkling installations or the chemical control of fungi and insects. The storage place also needs to be protected against theft and fire.

Good storage requires a fair amount of investment which bears no interest during the period of storage.

During storage a good sorting and

grading system should be maintained. Yardsticks for sorting and grading are a consequence of the type of merchandise handled and the wishes of the customer. Prompt reaction to the demands of the customer should be the goal.

Transportation to the client in the tropical timber trade means covering long distances, nearly always by ship.

It should be realized that the bigger the amount of cargo offered the better the position of the shipper is to negotiate freight rates. Cooperation between shippers strengthens this position. The overall efficiency of the shipper is of importance and influences the coming to terms and prices. Such efficiency consists in the merchandise being available for loading at the right place and at the right time, with all administrative paperwork completed and the cargo in a condition that makes loading as easy as possible.

The customer will demand shipping on time; to him the time of delivery is of the utmost importance as his whole scheme of re-selling and, as a consequence, the production scheme of the industry using the timber, depends on the delivery time schedule. Or, to put it the other way around: the manufacturing programme influences the time of importation, which fixes the ultimate time of shipping.

The conduct of business is based on a certain amount of mutual trust between buyer and seller. But such an affinity has to grow, and this takes time. Eventually it develops to a certain extent into an interdependence between the two parties.

Images and facts

The seller, in his search for clients, tries to put forth the image of a solid businessman, and, of course, this should not be just an image, it should be a fact. Especially in the initial contacts, the potential client should be impressed by this. An open approach, based on trust, is usually a good starting point.

Contacts can be made: (1) directly, through a personal approach; (2) via an introduction through a mutual acquaintance, which already establishes a certain trustworthiness; (3) directly through group presentation, such as missions, fairs, special shows.

It is of extreme importance that the contacting salesman should be equipped with a thorough background concerning what he is selling and how business should be conducted; otherwise he will be seen as "another amateur," not to be taken seriously.

Timber importers expect contracts and agreed prices to be kept, delivery

dates met and quality and quantity to be as specified. All of this is vital to the importer because the moment he signs a contract he starts selling the timber, which still may not have been felled in the forest. Some importers distrust government export organizations because, they say, they have had poor experience with regard to agreed conditions not being met as a result of local political factors.

Information

Through gathering a maximum amount of information, and by analysing and studying it, the seller has to form an opinion about his timber, the price at which he can afford to sell it and where he can be competitive in the market.

He goes about this task by gathering the following information:

1. Statistics on volume and species of timber consumed, and prices in a specific market. It is not easy to procure statistics and information linking species to price. Conversion factors for roundwood to plywood, sawnwood, etc., are also necessary. The same applies to prices: for roundwood to sawnwood a factor 1.8 has been useful, at least until now.
2. Economic reviews of world or local situations.
3. Trade and investment information from newspapers and professional magazines. For example, trends of building activity in certain countries and, in particular, of wood-using industries, such as furniture production.
4. Political situations within and between countries; for instance, political developments which may influence economic affairs in the field in timber-producing countries, in the countries of competitors, in the countries of buyers.
5. Government rules on exports and imports.
6. Shipping possibilities and rates.
7. Specific information that can be gathered from personal contacts.

Having gathered information, the importer bent on selling his timber must analyse it. In this analysis he looks for the following:

1. What are the characteristics of

particular timbers sold in bulk in a particular market: general properties, physical/mechanical properties, workability, etc.?

2. What are the main uses for these timbers: construction, furniture, finished or semifinished products?

3. What is the price level (f.o.b. or c.i.f.) for this bulk timber?

4. What are government plans in any given market for housing and construction, industrialization, road building, energy and energy costs, and how may timber fit into these plans?

5. Who are the established competitors? What type of timber (or competitive nonwood material) do they sell, and at what prices? What is their situation regarding shipping rates? How efficient are they in business? Where can their inefficiencies be taken advantage of?

6. Are there any agencies in this market that can assist in timber and wood product promotion through advertising, trade fairs, the assistance of government offices or trade organizations?

7. Is it possible to compose or procure a list, as complete as possible, of the wood products made in the area?

8. Are the customer's specifications really necessary or are they debatable in view of other qualities inherent in the available timber? Can the buyer be convinced to relax or change his specifications by offers of timber at a cheaper price?

9. What problems may the customer have with his present base material? Can a solution be provided?

10. Based on the list of products (point 7), where would the timber which is being offered for sale best be suited?

Needed

The point of all that has been said is that the men in charge of marketing timber need to have, in addition to good business sense, a broad approach toward placing timber and wood products on the market, a grasp of the technology of wood-based industries, the ability to gather and analyse information of various kinds which influences the market in different ways, and, most of all, a creative and not a static conception of the work. ■

THE WORLD OF FORESTRY

THE COMING IUFRO CONGRESS: FORESTRY AND LIMITED NATURAL RESOURCES

Forestry in a world of limited natural resources is the key subject to be discussed when the XVIth World Congress of the International Union of Forestry Research Organizations (IUFRO) meets at Oslo in mid-1976.

The Congress, scheduled from 21 June to 2 July, will offer an opportunity for forestry scientists from all over the world to examine their problems in all fields of research. A week's intensive debates on the campus of Oslo University will be followed by 18 excursions to various districts of Norway during which the participants are to continue discussing specialized aspects of their work.

IUFRO now has more than 9 000 scientists in its 290 member organizations in 74 countries. It held its first congress at Vienna in 1893 and the last one at Gainesville, Maryland, in 1971.

Four world personalities are to deal with the key subject from various angles at four plenary sessions from 22 to 25 June. The participants will then discuss their specific fields of activity in smaller groups.

In addition, the Congress is to agree on IUFRO policy and organization and to lay down a general plan for its work during the period until the next congress. This is of particular importance because a major part of the Organization's activities, between congresses, is carried on at meetings, seminars and symposia in various parts of the world, and individual scientists and IUFRO member organizations cooperate on a continuous basis.

To enable researchers to exchange ideas with their colleagues from other research organizations and countries, the main part of the Congress will consist of a series of specialist meetings.

The theme for these meetings depends on the work being carried on in the various subject groups, project groups

and working parties. IUFRO's six divisions are at present planning theme and content of the meetings.

Each division will have two half-day sessions with simultaneous translation. Some time will be used for organizational matters. The rest may be devoted to scientific work and discussions of common interest to all members of the division.

Congress groups are the smallest scientific groups which will work together during the Congress week. They are related subject and/or project groups organized by the divisions. The Divisional Coordinator has appointed a chairman for each congress group which will meet seven half-days during the week.

Discussions in the Congress groups may be based on an introductory paper. There will be one "invited paper" for each of the seven half-days for each of the 36 Congress groups. The Divisional Coordinator will appoint speakers for the invited papers according to the themes selected for the Congress groups.

The invited paper should be written in one of the three IUFRO languages (English, French or German) and should include a summary. The authors are also responsible for translations of the summary into the other IUFRO languages. Total length of an invited paper should not exceed 12 typewritten pages which include the paper itself, the summary, and the translation of the summary into the other two languages.

Authors of invited papers are asked to follow strictly the guidelines for IUFRO papers prepared by the IUFRO Executive Board. The paper will be photocopied and will appear in the proceedings of the Congress in the form in which it is submitted by the author. No editing will be possible.

The deadline for submitting invited

papers is 1 February 1976. A paper reaching the President's office after this date will not be included in the proceedings.

Some of the six divisions may wish to include symposia or seminars taking more than one half-day. This will be left to them to organize. A division may also wish to invite more than one speaker per half-day, for example two speakers presenting six pages each.

The proceedings will be printed and bound before the Congress, six volumes, one per division. Participants in the Congress will receive the volume of the proceedings of the division in which they have registered. They may buy additional volumes.

IUFRO's six divisions deal with the following subjects:

- 1 — Site and silviculture.
- 2 — Forest plans and forest protection.
- 3 — Forest operations and techniques.
- 4 — Planning, economics, growth and yield, management and policy.
- 5 — Forest products.
- 6 — General subjects (recreation, landscape, statistics, terminology, information, education, history).

Participants in the Congress are invited to bring discussion papers to the meetings. These papers should correspond to the subjects selected by the division, to be announced later.

A discussion paper should be prepared according to the guidelines for IUFRO papers. It should be written in one of the three IUFRO languages and include a short summary. The summary should be translated into the other two IUFRO languages. Total length of a discussion paper should not exceed six typewritten pages, which includes the paper itself, the summary and the two translations of the summary.

Authors should bring about 100 copies of their discussion papers. The Congress Report will list all discussion papers,

together with the name and address of the author.

A special scientific meeting is to be held on 25 June in cooperation with FAO.

At the opening session of the Congress, IUFRO will announce the winners of its Scientific Achievement Awards.

Each division should discuss its general policy during the period up to the next Congress and the names of candidates for IUFRO officers should be submitted to the International Council for election. A division may also wish to propose to the Council recommendations to governments and to national or international organizations concerning the objectives of the Union.

The International Council is the supreme authority on Union affairs. It consists of one representative and a deputy representative from each country.

IUFRO member organizations in each country should appoint their national representative. An unrepresented coun-

try will be given membership on the Council 60 days after a valid nomination has been received by the President.

At the closing session of the Congress, the President will inform it of the Council's decisions regarding Union activities, resolutions and any other matter which has to be brought to the members' attention. Announcements will also be made on IUFRO officers newly elected and appointed by the Council and on IUFRO's future policy and work.

Plenary sessions

Plenary sessions will take place in two halls, one accommodating up to 1 500 persons, the other 600, and both equipped for simultaneous translation. In addition, there are some 50 auditoriums seating from 50 to 200, where smaller meetings will be held.

A social event will take place on the afternoon following the closing session

and before participants set out on the 18 specialized excursions.

The Congress service system will look after support facilities, such as travel agency, bank, post office, audio-visual equipment, typing and translation.

In addition to the hotels in the city of Oslo, up to 900 participants may stay at the university dormitories and another 300 at the dormitories of the Agricultural University at Ås. These are modern and well-equipped quarters.

Exact costs for participation cannot yet be given. Estimated costs per reservation are: the Oslo Congress US\$300 to \$400, excursions \$200 to \$350, for a total of \$500 to \$750.

A publication on the Congress, with registration forms, has been distributed to IUFRO member organizations and is available by writing to:

IUFRO,
Norwegian Forest Research Institute,
N-1432 Ås - NLH, Norway.

THE XVth IUFRO WORLD CONGRESS AT A GLANCE

Oslo, 21-26 June 1976

Hour	Monday 21	Tuesday 22	Wednesday 23	Thursday 24	Friday 25	Saturday 26
9.00 ↓ 10.00		Forestry in a world of limited resources				
		Key Address I <i>Congress Hall (a)</i>	Key Address II <i>Congress Hall (a)</i>	Key Address III <i>Congress Hall (a)</i>	Key Address IV <i>Congress Hall (a)</i>	Key Address V <i>Congress Hall (a)</i>
10.00 ↓ 13.00	Opening Session <i>Congress Hall (a)</i>	Division 2 <i>Congress Hall (a)</i> DIVISION 3 <i>Congress Hall (b)</i> Congress Groups <i>Conference Rooms</i>	Division 1 <i>Congress Hall (a)</i> Division 4 <i>Congress Hall (b)</i> Congress Groups <i>Conference Rooms</i>	Division 5 <i>Congress Hall (a)</i> Division 6 <i>Congress Hall (b)</i> Congress Groups <i>Conference Rooms</i>	International Council <i>Congress Hall (a)</i> Congress Groups <i>Conference Rooms</i>	Closing Session <i>Congress Hall (a)</i>
15.00 ↓ 18.00	Division 1 <i>Congress Hall (a)</i> Division 4 <i>Congress Hall (b)</i> Congress Groups <i>Conference Rooms</i>	Division 5 <i>Congress Hall (a)</i> Division 6 <i>Congress Hall (b)</i> Congress Groups <i>Conference Rooms</i>	Division 2 <i>Congress Hall (a)</i> Division 3 <i>Congress Hall (b)</i> Congress Groups <i>Conference Rooms</i> 17.00 Midsummer eve outing by ship to an island	International Council <i>Congress Hall (a)</i> Congress Groups <i>Conference Rooms</i>	Special Meeting <i>Congress Hall (a)</i> FAO/IUFRO Meeting	

International forestry meetings* 1976

WHAT THE ACRONYMS MEAN

CILSS = Permanent Interstate Committee for Drought Control in the Sahel (Comité permanent inter-états de lutte contre la sécheresse au Sahel)

UNSO = United Nations Sahel Office

ECE = Economic Commission for Europe

IUFRO = International Union of Forestry Research Organizations

SIDA = Swedish International Development Agency

IUCN = International Union for the Conservation of Nature and Natural Resources

* Unless otherwise designated, all meetings are of FAO bodies.

** Joint ECE/FAO Timber Division, Palais des Nations, 1211 Geneva 10, Switzerland.

*** Undetermined.

When	Where	What	FAO Forestry Department contact
January	Dakar	CILSS/UNSO/FAO Seminar on the role of forestry in a rehabilitation programme for the Sahel	A. Polycarpou, Forest Conservation and Wildlife Branch
2-7 Feb.	Cuba	Latin American Forestry Commission (12th session)	J.E.M. Arnold, Plans Unit
February	Cuba	Latin American Forestry Commission Committee on National Parks and Wildlife (4th session)	G.S. Child, Forest Conservation and Wildlife Branch
23-27 Feb.	Ottawa	North American Forestry Commission (8th session)	J.E.M. Arnold, Plans Unit
5-13 April	Rome	Committee on Forest Development in the Tropics	O. Fugalli, Forest Management Branch
24-28 May	Rome	Committee on Forestry (3rd session)	L. Gimenez-Quintana, Office of the ADG
Late spring/early summer	Geneva	Ad hoc Meeting of Experts to revise ECE standards on stress grading of coniferous sawn timber and to draft ECE standards on finger-jointed timber	E. Kalkinnen**
11-13 May	Rome	FAO Advisory Committee of Experts on Pulp and Paper (17th session)	L. Lintu, Pulp and Paper Branch
14-19 June	Finland	Joint FAO/ECE/ILO Committee (11th session)	H. Chauvin, Forest Logging and Transport Branch
5-6 July	Oslo	FAO/IUFRO Consultation on Forestry Research Problems in Developing Countries	J. Prats Llauradó, Forestry Institutions and Education Branch
8-27 Aug.	Lima (Peru)	FAO/SIDA Consultation on Employment in Forestry for Latin American Countries	G. Segerström, Forest Logging and Transport Branch
6-15 Sept.	Toulouse	European Forestry Commission Working Party on Management of Mountain Watersheds	S. Kunkle, Forest Conservation and Wildlife Branch
18-22 Oct.	Geneva	ECE Timber Committee (34th session)	E. Kalkinnen**
***	Netherlands	Executive Committee of the International Poplar Commission (28th session)	O. Fugalli, Forest Management Branch
***	***	African Forestry Commission (4th session)	J.E.M. Arnold, Plans Unit
***	***	African Forestry Commission Working Party on Wildlife Management (5th session)	G.S. Child, Forest Conservation and Wildlife Branch
***	***	Joint FAO/IUFRO Symposium on Forest Fires	Tran Van Nao, Forest Management Branch
***	***	World Conference on Arid Zone Forestry	A. Polycarpou, Forest Conservation and Wildlife Branch
***	***	FAO/SIDA Seminar on Forest Resource Appraisal in Forestry and Land Use Planning	J.P. Lanly, Forest Management Branch

Meetings which did or will take place in 1975

When	Where	What	FAO Forestry Department contact
4-6 Feb.	Paris	UNEP Workshop on the pulp and paper industry and the environment	L. Markila, Pulp and Paper Branch
6-16 Feb.	New Delhi	World Consultation on Wood-based Panels	J. Swiderski, Mechanical Wood Products Branch
17 Feb.	New Delhi	Committee on Wood-based Panel Products (4th session)	J. Swiderski, Mechanical Wood Products Branch
7-12 April	New Delhi	Second FAO World Technical Consultation on Forest Diseases and Insects (in collaboration with IUFRO).	Tran Van Nao, Forest Management Branch
21-25 April	Geneva	Joint FAO/ECE Working Party on Forest and Forest Products Statistics (10th session)	E. Kalkinen**
14-16 May	Rome	Advisory Committee of Experts on Pulp and Paper (16th session)	L. Lintu, Pulp and Paper Branch
7-20 Sept.	Kinshasa	IUCN 12th General Assembly and 13th Technical Meeting	G.S. Child, Forest Conservation and Wildlife Branch
22-26 Sept.	Ibadan	Garoua International Symposium on Wildlife Management	G.S. Child, Forest Conservation and Wildlife Branch
20-24 Oct.	Geneva	European Forestry Commission (17th session)	J.E.M. Arnold, Plans Unit
20-24 Oct.	Geneva	ECE Timber Committee (33rd session)	E. Kalkinen**
October	Geneva	First Session of the Working Group on the Applications of Meteorology to Forestry	A. Polycarpou, Forest Conservation and Wildlife Branch
1-6 Dec.	Rome	International Poplar Commission (15th session)	O. Fugalli, Forest Management Branch

** Joint ECE/FAO Timber Division, Palais des Nations, 1211 Geneva 10, Switzerland.

FAO and UNEP plan forest fire programme

The deterioration of the human environment due to forest fires has prompted FAO and the United Nations Environment Programme (UNEP) to launch plans for a programme to come to grips with the problem. The initial planning work is being financed by UNEP and carried out by FAO. Aims would include:

— Identifying areas where forests are more susceptible to fire. Elaborating a methodology for the assessment of fire dangers, using meteorological observations in combination with the characteristics of the vegetation and topographic conditions.

— Encouraging countries to develop and improve fire-detection systems and to strengthen fire-fighting organizations and techniques.

— Promoting regional cooperation on forest fire control by improving the exchange of information on techniques and equipment, encouraging research and mutual aid.

The programme of work for this project was reviewed by a team of forest fire experts and foresters in Rome in May.

The FAO/UNEP Expert Consultation on Detection and Control of Forest Fires for the Protection of Human Environment reviewed a programme prepared by Mr. Carl Wilson, a U.S. forest fire expert. The programme selected three regions — Mediterranean, African savanna, and pine forest in Central America — where problems are considered urgent and where regional cooperation can be achieved because of similarity of conditions.

In 1973, according to a report presented to the meeting, eight countries

bordering the Mediterranean had between 20 000 and 25 000 fires which burned possibly as much as 250 000 hectares. It was generally agreed at the meeting that fires in these countries are rarely the result of lightning and almost always spring from human negligence, such as discarded cigarettes and careless outdoor cooking fires.

In many developing countries slash-and-burn agriculture is a major cause of extensive forest fire damage.

Chinese pulping reeds

In Hunan province, reed cultivation in the Dungting lake area provides 100 000 metric tons of reed pulp for paper manufacture. The reed plantations are located on an area which includes 50 000 hectares of reclaimed marshland.

China Today, Peking

paper and progress
go together



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legislation

new and amended

The following list was prepared by the FAO Legislation Branch and the Forestry Department from official government journals and gazettes regularly submitted to FAO. For further information contact the governments directly.

General forest legislation

CHILE

Decree-Law No. 945 of 24 March 1975 amending Decree-Law No. 701 of 15 October 1974 establishing regulations governing forest lands. Introduces considerable amendments to the 1974 Decree-Law, particularly with respect to the provisions concerning forestry incentives. Regulations for the implementation of Decree-Law 701 were adopted on 26 December 1974. (D.O. No. 29.112, 25 March 1975, p. 1153; [regulations] D.O. No. 29.084, 20 February 1975, p. 705.)

PERU

Supreme Decree No. 014-74 — MINCOM prohibiting the export of roundwood, 23 September 1974. (EL.P. No. 9993, 26 July 1974, p. 7.)

SPAIN

Order of 4 October 1974 completing and amending the Order of 30 April 1970 on aid to forest industries. The Department of Agrarian Production will establish the subsidy applicable for each work and owner concerned, provided that in no case may such subsidy exceed 50 percent of the approved estimate. (B.O.E. No. 244, 11 October 1974, p. 20679.)

SWITZERLAND

Federal Law of 4 October 1974 on land-use planning requires each canton to establish land-use plans on a multiple-use basis including forestry and protection and to coordinate their efforts in this respect. Among provisions are those regarding contents of land-use plans, incentives, expropriation or other curtailment of rights, establishment of a Federal and cantonal administration, protection of rights, etc. (F.F. No. 41, 14 October 1974, p. 816.)

TUNISIA

Decree-Law No. 74-5 of 4 July 1974 completes the code concerning delimitation, conservation and improvement of pastures in communal or state land. The size of pastures is to be determined by a committee set up in each province, and is subject to management plans prepared by the Forest Service. (J.O. No. 52, 9/13 August 1974, p. 1803.)

URUGUAY

Decree No. 760/974 of the Ministry of Agriculture and Fisheries allowing deductions from the Tax on Minimum Required Production (IMPROME) in respect of cattle farms as reinvestment in afforestation for protection or production purposes. (D.O. No. 19370, 4 October 1974, p. 46-A.)

VENEZUELA

Resolution requiring licences issued by the Ministry of Development for the export of sawn logs, 8 August 1974. (G.O. No. 30.468, 8 August 1974, p. 228.526.)

Forest industries

ARGENTINA

Decree No. 1.177 of 16 April 1974, Industrial Promotion. Declaring as priority activities those for the manufacture of newsprint, long fibres and other products. Prior authorization of the Ministry of Economy is required for the setting up of promoted forest industries, in order to allow for planning for the sector and allotment of funds to cover the appropriate expenses. (B.O. No. 22.896, 22 April 1974, p. 4.)

UNITED STATES

CFR. 40. Protection of the Environment. Chap. 1. Environmental Protection Agency. Subchap. N. Effluent guidelines and standards. Part 429. Timber Products Processing Point Source Category. 8 April 1974. (F.R. Vol. 39, No. 76, 18 April 1974, p. 13942 [new Part].)

Wildlife

FRANCE

Order regarding the regulation of the protection of living wild animals during transport, 13 December 1974. (J.O. No. 301, 25/26 December 1974, p. 13041.)

Hunting regulations

SPAIN

Decree 2612/1974 of 9 August 1974 concerns the functioning of national hunting reserves. These specified areas are administered by the Provincial Division of the National Institute for Nature Conservation, assisted by an advisory committee, under wildlife management plans which include development and protection such as the annual quota of hunting permits, etc. (G.M. No. 223, 17 September 1974, p. 19095.)

URUGUAY

Decree No. 273/974 of 4 April 1974 approves Ministry of Agriculture and Livestock hunting regulations which authorize the unrestricted hunting of specified indigenous species, but restricts partridge hunting and prohibits duck hunting. (D.O. 19255, 23 April 1974, p. 139-A.)

VENEZUELA

Resolution of 2 April 1974 of the Ministry of Agriculture declares a two-year ban on sport hunting of all species of wild animals throughout the national territory. (G.O. No. 30 367, 2 April 1974, p. 227-600.)

National parks

AUSTRALIA

The National Parks and Wildlife Conservation Act 1975 is a basic enactment making provision for and in relation to the establishment of national parks and other parks and reserves both on land and in coastal waters, and the protection and conservation of wildlife in Australia, and allowing for the implementation of international agreements to which Australia is party. Act No. 12, 13 March 1975.

MALAWI

G.N. No. 102 — National parks regulations of 1 August 1973, under the National Parks Act, deal with entry permits, traffic restrictions, prohibited acts, notices, fences, signposts, trading, etc. (M.G.G. No. 38, 17 August 1973, Supp. 1, No. 30 A, p. 141.)

Concerning the world's appetite for wood

World consumption of wood: trends and prognoses, by András Madas. Budapest, Akadémiai Kiadó, 1974. 130 p. Price 15 forints. (In English)

It is indeed interesting and useful to have a book on the trends, developments and outlook in world wood consumption written by a senior officer responsible for agricultural and forestry planning in an important socialist country. Dr. Madas, the author of this impressive book, in addition to his national responsibilities, is the chairman of the United Nations Economic Commission for Europe (ECE) Timber Committee, which is continually following developments in the forest products markets of North America, Europe and the U.S.S.R. His experience makes him eminently qualified to produce such a book.

The book has an opening explanatory chapter dealing with the functions of the forest and with planning in the forestry and timber economy. A concluding chapter treats the possibilities of achieving the role expected of forestry as resolved in the main part of the book, which explores the likely requirements for wood by the turn of the century.

The author has drawn heavily on the world and regional studies of FAO and ECE, as well as on the works of numerous national experts and agencies of major countries of the world, including Japan, the United States and the U.S.S.R. However, the author has himself made a major contribution to the understanding of world and regional trends in wood consumption. As is usually the case with all major studies of this sort which report substantial statistical evidence from numerous sources, there are several instances when events have overtaken the preparation of the book with new material becoming available. Notable examples of this are the availability of several major new national

appraisals, as well as several regional studies or world commodity group studies recently prepared or in preparation by FAO and ECE.

In discussing the position of capitalistic countries in planning, Dr. Madas is quite correct in drawing attention to their historic reluctance in committing themselves to "plans." But he is on unfirm ground in crediting the fact that an increasing number of prognoses have been undertaken because of the need for social control of the forests stemming from the new importance being given to protective and recreational functions. The book does seem to overlook the fact that national appraisals of wood demand and supply situations have for long been considered important and even routine in many market economy countries. These analyses have served as a background for both government and private industry "planning" for many years. The book does not, for example, give cognizance to the fact that Canada and the United States have had a series of special studies of this type, beginning in the latter country in 1909, and where they have been required by law since 1928.

Major influences

The core of the book deals with prognoses of the timber consumption in all major regions of the world, first in terms of industrial roundwood as a whole and subsequently as major processed products: sawnwood, wood-based panels and paper and paperboard. The author examines the major factors influencing the consumption of industrial wood, including the level of economic development, the availability of wood, the long-term tendencies of wood prices, the growth of population and technological progress.

The historical consumption data which Dr. Madas has used in his analysis ex-

tends over the period 1913 to 1968 and, with this long range, trends frequently look considerably different than for shorter periods of 10 or 20 years. Indeed, he has made rather convincing applications of the approaches of the Hungarian economist F. Jánosy to time-based trend calculations, using data of the long-term period for industrial wood, as a whole, and for major processed assortments. He has used the principle of extending the trend of peaks, rather than average levels, and in so doing has pointed out that he avoids using short-term trends which may indicate rapid growth in recovery periods or, conversely, may indicate a low growth or decline during periods of stress. He also makes use, although in a fairly elementary nature, of the relationships between per caput income and per caput consumption. He points out the major differences which exist between importing and exporting countries, reflecting their level of wood availability. He has made use of the index of wood availability as developed by G. Gregory.

The author is rightfully critical of the lack of detailed analyses of price developments and their effects in many of the studies which have been reviewed. However, in common with authors of other studies of this breadth, covering a variety of products, he has been limited in the contribution which he could make in dealing with this aspect. He does point out that there are many factors tending to make wood and its products relatively more costly over time, that various long-term trends confirm this, and that assuming constant relative prices or a continuation of the relatively stable price trends of much of the 1950s and early 1960s is most questionable. However, the analysis does not suggest any effective quantitative measure of price impact (e.g., price elasticity). The effect of price trends is, of course, im-

plicitly accounted for in his projections of long-term trends. His criticism of the 1965 *Timber trends in the United States*, with respect to the constant price assumption, is invalidated by the more recent 1973 *Outlook for timber in the United States* which puts considerable emphasis on the developments and effects of prices in its analyses and especially in its alternate projection of demand.

Dr. Madas suggests that total world consumption of wood for the year 2000, or at least within the decade or two thereafter, will reach something in the order of 5 000 million cubic metres, of which roughly 1 000 million might be fuelwood, about the same at its current consumption level. Thus, he suggests that total wood consumption may be by the end of the century two to two and a half times its 1968 level, with the industrial wood component of this increasing to three to three and a half times its current level.

Year 2000

After adding to these requirements other needs supplied by the forest: other productive functions (e.g., grazing, hunting, water supply), protection, recreation and the supply of oxygen, the book reviews the world's forests, potential trade prospects and the evolving supply pattern. Without actually stating that the world's forests can supply the demands made upon them in 2000, he clearly concludes that the potential for this is more than enough and that the virgin forest will last into the next century as plantations increasingly supply a firm basis for development in the more distant future. In this process he foresees "a uniform world market of wood and wood products in the making."

On reflection, one is struck by a major implication of the book — that the developing demand pattern is nearly inevitable, that future consumption is largely predetermined and that the major alternatives for the planners to consider are from where and how world wood requirements will be supplied. One cannot but question whether, and especially in a planned economy, some reasoned national objectives and targets may not justify the use of policy instruments in shaping the emerging demand pattern.

This book is clearly in the "must read" list for all foresters and planners concerned with the development of this important sector.

S.L. Pringle

FAO Forestry Department, Rome

unasyuva manuscript style

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Length

Long articles are 3 000 to 4 000 words, and short articles are 750 to 2 000 words.

Republished articles

unasyuva prefers original articles but does not rule out reprints, especially where there is the possibility of exchanging views and developments of basic importance in forestry and forest industries between readers in developed and developing regions of the world or where language considerations are involved.

Queries in advance

We welcome letters from writers suggesting ideas and subject matter for proposed articles. They usually result in articles of a higher quality and in a saving in writing and editing time.

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— Government officials, in particular the executive level of national forest services, wildlife departments and national parks. This also includes delegates and missions attached to the United Nations and its specialized agencies and staff members of international organizations dealing with forestry, environment, forest industries and trade.

— Forestry schools and institutes, both through their libraries and subscriptions to individual staff members.

— Forest industry companies dealing with services for forestry, companies dealing in forest products.

— Individual professional foresters, especially those concerned with international forestry.

— Editors of professional and trade journals dealing with forestry, forest industries and environmental conservation.

BOOKS RECEIVED

Authors and publishers of forestry books who would like their works listed and considered for review should send reviewer's copies to the Editor, unasylla.

Forestry — general

- Bary-Lenger, Anne. *La forêt: écologie, gestion, économie, conservation*, by Anne Bary-Lenger, René Evrard, Pierre Gathy. Liège Vaillant-Carmanne, 1974. 588 p., illus.

Forest features, tree species, production forestry, nurseries, management and logging operations, wood technology and processing, forestry in modern society.

- Huchon, H. *Connaissance de la forêt*. 3rd ed. rev. et augm. Paris, Maison rustique, 1973. 156 p., illus.

Tree components and structure, main species, forest output and benefits, cultivation, land and the protection of nature.

- Hutchinson, John. *The families of flowering plants arranged according to a new system based on their probable phylogeny*. 3rd ed. Oxford, Clarendon Press, 1973. 968 p., illus.

● reflex. Fil. Monocotyledones.

● Scientific and Technical Services. *Forestry and forest products groups in the Pacific region*. 2nd ed. Canberra, 1973. 13 p. Broad subject in products groups subject index. Detailed by country.

- Willis, J. *Plants and ferns*. Shaw. Cambridge, 1973. 1303 p. rev. by H.K. Airy.

Environment

- Daubenmire, Rexford F. *Plants and environment: a textbook of plant autecology*. 3rd ed. New York, Wiley, 1974. 422 p.

Soil, temperature, light, fire, atmosphere, and the biotic factor. The environmental complex, ecological adaptation and evolution.

- *International Symposium on Biology of Woody Plants, 1967, Nitra, Czechoslovakia*. Bratislava, Publishing House of the Slovak Academy of Sciences, 1973. 720 p., illus.

Systems, morphology, genetics and improvement of woody plants. Physiology and biochemistry of woody plants. Ecology and introduction of woody plants.

- Johansson, Dick. *Ecology of vascular epiphytes in west African rain forest*. Uppsala, Svenska Västgeografiska Sällskapet, 1974. 129 p., illus. Summary in French.

Dissertation (Doctor of Philosophy) - Uppsala University.

The epiphytic flora. Biology of vascular epiphytes. The occurrences of epiphytes. Environmental influence. Distribution of the phorophytes.

- Stern, Klaus and Laurence Roche. *Genetics of forest ecosystems*. Berlin, Springer-Verlag, 1974. 330 p.

The ecological niche. Adaptations. Genetic systems. Adaptive strategies. Forest ecosystems. How man affects forest ecosystems.

- *Tropical forest ecosystems in Africa and South America: a comparative review*. Edited by Betty J. Meggers, Edward S. Ayensu and W. Donald Duckworth. Washington, Smithsonian Institution Press, 1973. 350 p., illus.

The aim of this comparison of the two ecosystems is to identify some of the problems of adaptation facing plants and animals, including man.

- Won, Pyong Oh and Yong No Lee. *Wildlife and flowering plants*. Seoul, Korean Overseas Information Service, 1973. 126 p., illus.

- Franclet, A. *Espèces pour la constitution de "filtres" végétaux et de réserves fourragères*. [Tunis.] 1973. 8 feuilles. Institut national de recherches forestières. FAO-UNDP. Institut de reboisement de Tunis. Note technique N° 15.

Suggested selection of species according to uses and regions.

- Gindel, I. *A new ecophysiological approach to forest-water relationships in arid climates*. The Hague, Junk B.V., 1973. 142 p., illus.

Environment. Consumption of soil water by trees. Absorption of atmospheric moisture by woody xerophytes. Transpiration. Xerophytism.

- Pesson, P. et al. *Écologie forestière. La forêt: son climat, son sol, ses arbres, sa faune*. Paris, Gauthier-Villars, 1974. 282 p.

Geobiology, ecology, management.

Silviculture

- Centre Technique Forestier Tropical. *Contribution à l'étude de la désertification de l'Afrique tropicale sèche*. Nogent-sur-Marne, 1973. 80 p., illus.

Reprinted from: *Bois et forêts des tropiques*. Summaries in English and Spanish.

Report of the Anglo-French Forestry Mission to Nigeria and Niger, 1936-37. Desertification of the Chad Sahelian zone. Desertification of Africa south of the Sahara. Is the Sahara advancing southward?

- *Conference on Southern Forest Tree Improvement*, Baton Rouge, La, Louisiana State University and U.S. Forest Service, 1973. 352 p.

Genetic gains and advanced generation breeding. Seed orchard management, problems and progress. Conservation of forest gene resources. Advances in hardwood tree improvement.

- Enescu, Valeriu. *Ameliorarea arborilor*. Bucuresti, 1973. Summary in English and French.

Genetical bases of tree improvement. Tree reproduction. Breeding methods.

- el-Hamrouni, A. et M. Sarson. *Observations préliminaires sur certains cactus locaux ou introduits en Tunisie*. Tunis, Institut national de recherches forestières, 1973. 79 p., plates. FAO-UNDP.

Bio-climatic data, cactus (thorny and thornless).

- *Insect/plant relationships*. Edited by H.F. van Emden. Oxford, Blackwell, for the Royal Entomological Society, 1973. 215 p., plates.

Plants and insect life cycles. The evolution of the insect/plant relationship. The insect/plant relationship in population dynamics.

- Organisation for Economic Co-operation and Development. *OECD scheme for the control of forest reproductive material moving in international trade*. Paris, Directorate for Agriculture and Food, 1974. 24 p.

Categories of reproductive material. Delimiting regions of provenance. List of approved basic material. Approval of basic material. Production of all categories of forest reproductive material. Inspection, sealing and labelling. Method of operation of the scheme.

● Planting Research Committee. [Scientific report of planting research using alpine plants in the Tateyama route area in the Japan Northern Alps National Park (Chubusangaku National Park).] [Toyama], Japan, Tateyama Kurobe Kanko, 1974. 1 v., illus. col. plates. Text in Japanese.

Landform, geology and climate of Mt. Tateyama. Vegetation of the adjacent areas of Tateyama-Kurobe alpine route. Plantation trials using the alpine plants in the devastated area of Mt. Tateyama. Germination and growth of alpine plants originating from Mt. Tateyama.

Forest injuries and protection

● *Studies on the shootborer Hypsipyla grandella (Zeller) Lep. Pyralidae.* P. Grijpma, editor. Turrialba, 1973. 1 v., illus.

Collection of articles resulting from research on the shootborer *Hypsipyla grandella* (Zeller) carried out by members of the Inter-American working group. The articles are published in English or Spanish and abstracts are included.

● Davis, K.P. and A.A. Brown. *Forest fire control and use.* 2nd ed. New York, McGraw-Hill, 1973. 686 p., illus.

Fire in the forests. Control of forest fires. Fire in wildlife management.

Forest management

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Compiled by Lidia Spadafora Lombardi, FAO Library.

Pulp and paper from the tropics

Paper, in large quantities and many grades, is indispensable to any society which wants to progress. It should not be surprising, therefore, that the Third World is putting pulp and paper mills near the top of the list of industries it wishes to have. Furthermore, the potential for creating such industries is very high in many of the countries of the tropics since most of the world's forests are located there and their ecological conditions favour plantations of fast-growing tree species. Developing countries with forests are conscious as never before of the potential for converting this fibre into pulp *themselves*.

The task of establishing mills is as difficult as it is urgent but we are convinced that these difficulties can be dealt with effectively right now and in the immediate years ahead if there is a genuine will to do so among those concerned with pulp and paper development in both the developed and developing worlds. New production capacity should be established as much and as soon as possible in developing countries and mixed tropical hardwoods should be the first species to be utilized by these new industries. At the same time, plantations of fast-growing pulpwood species should be greatly increased in order to be able to rely more on these in the future. Many developing countries understood this years ago and are now well advanced in their plantation programmes.

If the forest-rich countries of the tropics are to have their own pulp and paper industries they themselves, first of all, must become fully conscious of the value and the potential of their forests. But along with this awareness there must also be the determination to raise the level of efficiency of the various institutions which are responsible for social, economic and technical development within these countries.

At the same time the developed countries will have to demonstrate their readiness to transfer the necessary income and technology to the developing countries. This should be reflected in trade and investment policies.

Finally, both developed and developing countries must make efforts in training personnel and in research in this essential industry.

FAO, long involved in all these efforts, looks forward to expanding its role in bringing pulp and paper production to the tropics.

Where research is needed

Science, rushing ahead at fantastic speed in the past 75 years, has been largely responsible for the progress that man has achieved over his material state of being. It

has also contributed greatly to the uneasy state of togetherness of the four thousand million members of the family of man. In the Third World there is a deep awareness that science, technology, research are at the very heart of the matter of the progress of humanity.

At the forthcoming Congress of the International Union of Forestry Research Organizations in Oslo (see World of Forestry) we hope that there will be a corresponding awareness of the need to greatly strengthen the foundations of forestry research in the Third World.

Specifically, what is most urgently needed is much more work in tropical forestry, both humid and arid. One part of this effort should involve greater coordination and dissemination of the knowledge already existing, both in developing and developed countries. Another part concerns the building of research facilities for forestry in developing countries themselves and the training of personnel from these countries. The coordination and dissemination of information will not be successful without adequate facilities and trained people in the countries of the tropics.

Conventional approaches toward the transfer of knowledge internationally should not be discouraged, but it should be understood that the effectiveness of such approaches is limited. What is truly effective is the implantation and nurturing of scientific and technical institutions in the developing countries. Cultural, psychological, social and political factors are all involved in the growth and use of science and technology and anyone who thinks otherwise — or does not care to think about it — is fooling himself.

The spirit and tradition of international cooperation and collegiality is of the essence of science and, we should be proud to say, also of the forestry profession. This should work in favour of man's efforts to better understand and manage the complex tropical environment, just as it has done in temperate zone forestry. There is another advantage in the existence of IUFRO itself. It is active, well organized and has the ideal structure, already firmly established, for the all-important system of communication and linkage between the various forest sciences and the many nationalities concerned with them.

Those who will attend the IUFRO Congress have a particular responsibility to consider whether and to what degree their specialization and the subjects to which they intend to address themselves apply to the needs of the greatest number of people and the most pressing needs of society. Not that all scientific work necessarily should, but unfortunately too much of it does not. The time in which we live asks more urgently than ever for a sense of responsibility in the apportioning of man's best efforts for mankind's most pressing and obvious shortcomings. No one has to strain his eyes to see where many of those shortcomings lie, at least in terms of material and social development: two thirds of the family of man is too big to ignore, nor is it capable of ignoring the other third.

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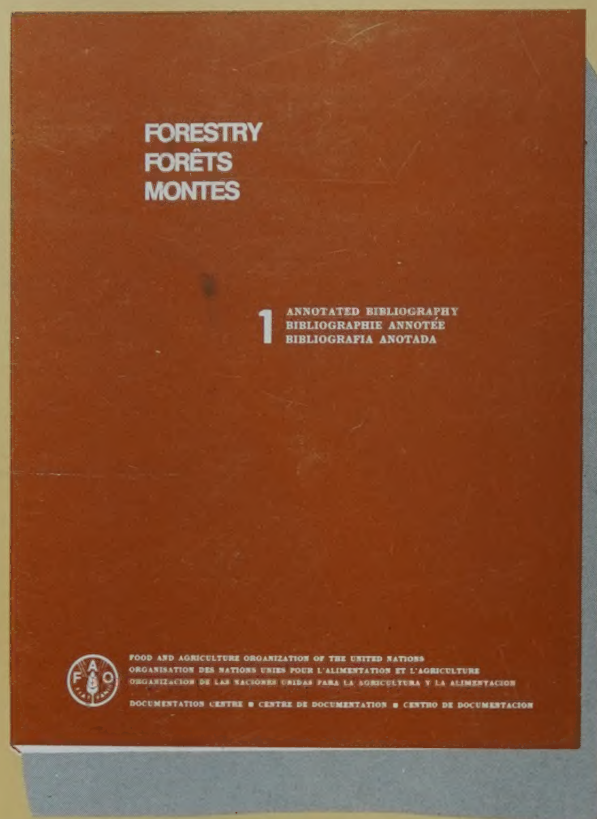
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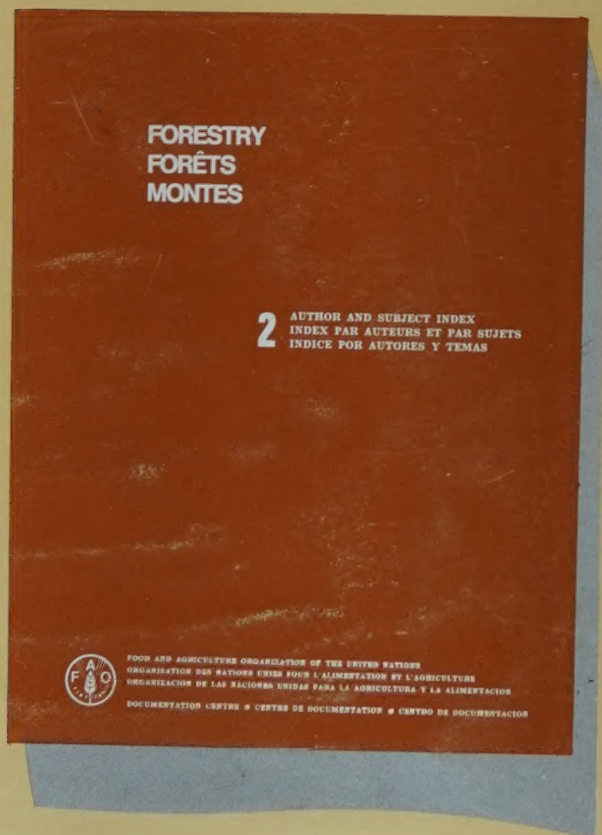
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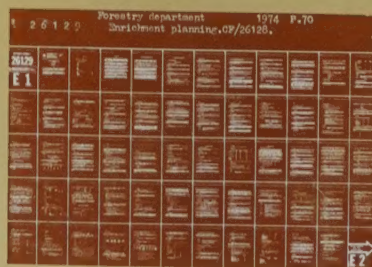
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